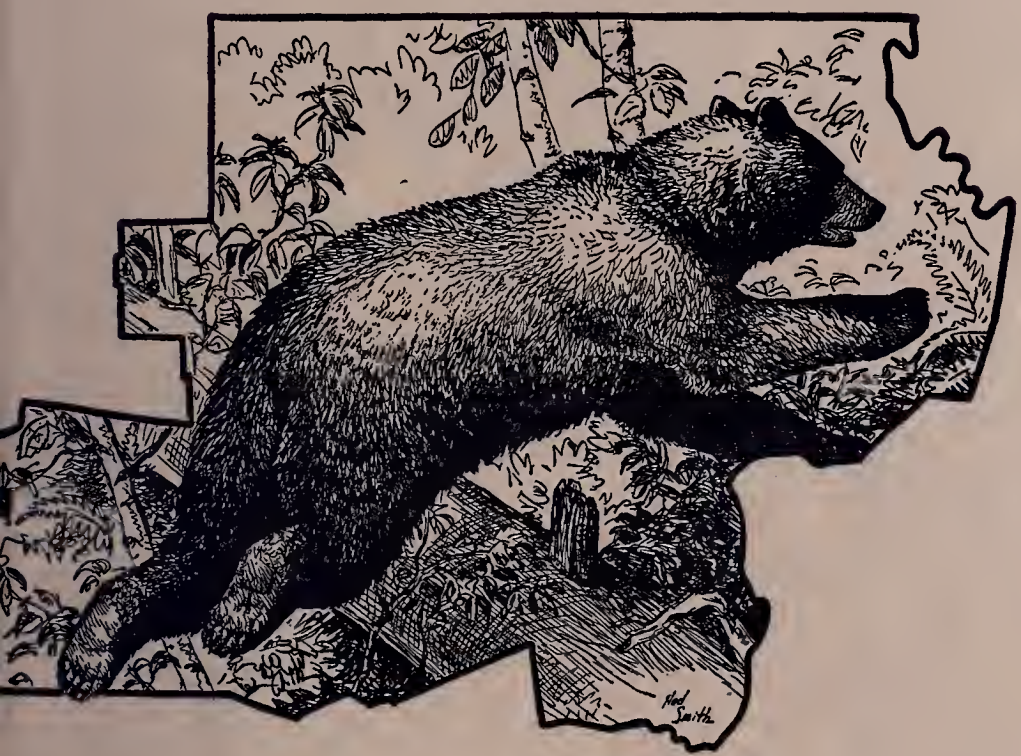
MAMMAL SURVEY

OF

Northcentral Pennsylvania



FINAL REPORT

PITTMAN-ROBERTSON PROJECT 37-R

COMMONWEALTH OF PENNSYLVANIA

JOHN S. FINE, *Governor*

★

PENNSYLVANIA GAME COMMISSION

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MAMMAL SURVEY

OF

Northcentral Pennsylvania

FINAL REPORT

PITTMAN-ROBERTSON PROJECT 37-R

BY

HARRY R. ROSLUND

PROJECT LEADER

PUBLISHED BY

PENNSYLVANIA GAME COMMISSION

HARRISBURG, PA.

★

1951

INTRODUCTION

The survey of the mammals of northcentral Pennsylvania is part of a state-wide survey to obtain practical management information about the mammals of the Commonwealth, with particular reference to their life histories, ecology, range, abundance, habitat preferences, economic importance, and the effects of land use on their populations.

Studies of the mammals of northwestern and southwestern Pennsylvania[*] (Pittman-Robertson Projects 20-R and 24-R) have been completed, and surveys of the northeastern and southeastern portions of the State (Pittman-Robertson Projects 42-R and 43-R) are in progress. A survey of the mammals of southcentral Pennsylvania (Pittman-Robertson Project 38-R) was conducted concurrently with the present project.

The *Mammals of Pennsylvania and New Jersey* by Samuel N. Rhoads, published in 1903, is the only previous comprehensive study of the mammals of the State. A popular work, *The Mammals of Pennsylvania* by Samuel H. Williams, appeared in 1928. It is hoped that the information presented here will be of value to all who are interested in our wildlife resources.

Although this report is based primarily on the field notes of the Project Leader and Assistant Project Leaders, everyone associated with the undertaking has contributed much in the way of information and suggestions. Responsibility for the accuracy of the information included here and for the interpretation of it is that of the Project Leader.

ACKNOWLEDGMENTS

The Survey of Pennsylvania Mammals (north central sector), Pittman-Robertson Project 37-R, was conducted under the Federal Aid to Wildlife Restoration Act of 1937, and was administered jointly by the Pennsylvania Game Commission and the United States Fish and Wildlife Service.

The Survey of Pennsylvania Mammals was inaugurated through the efforts of Hon. Ross L. Leffler, President of the Pennsylvania Game Commission, and Dr. J. Kenneth Doutt, Curator of Mammals, Carnegie Museum, Pittsburgh, Pennsylvania. The work of the Survey was planned and initially supervised by Dr. Doutt in his capacity as Supervisor,

Special Personnel. He was also responsible for the taxonomic studies involved.

Neil D. Richmond, Project Field Supervisor, was responsible for the planning, supervision and co-ordination of the field work with that of the other three parties.

Robert D. McDowell, Chief, Wildlife Research Division, Pennsylvania Game Commission, directed the project.

Miss Caroline A. Heppenstall, Assistant Curator of Mammals, Carnegie Museum, was responsible for the receiving, handling, and care of specimens and data.

Field work was done by the Project Leader and an Assistant Project Leader. Mr. Cole W. Wilde served as Assistant Leader during the period from March 7, 1949, to April 30, 1950. Mr. Frederick K. Hilton served in that capacity from May 17, 1950, until August 31, 1950. Mr. Lorenzo B. Pryor, Research Assistant, Wildlife Research Division, Pennsylvania Game Commission, performed various administrative duties.

The following persons served as part-time laboratory assistants in the preparation of skeletal material, food-habit studies, and in related tasks: Messrs. Francis Gabig, Eugene Gettig, John E. Guilday, A. C. Lloyd, Donald Mears, and Joseph C. Weimer.

Aenid Horton, Margaret McGregor, and LaVerne Mowry served at various periods in the capacity of stenographer.

To all who were directly associated with the project we wish to express our appreciation. In addition, we thank the following individuals and organizations:

Major George Stephens, commanding officer of the Susquehanna Sub-Depot of LetterKenney Ordnance Depot, for permission to conduct studies on the abandoned farm lands on the Depot.

The Pennsylvania Department of Internal Affairs, Topographic and Geologic Survey for permission to use their map of the physiographic regions of Pennsylvania.

The personnel of the North Central Division of the Pennsylvania Game Commission for specimens and assistance.

The many trappers, fur dealers, hunters, and landowners for information, specimens, and assistance.

CONTENTS

DESCRIPTION OF THE STUDY AREA

EXTENT

The areas included in this survey consist of the counties of Cameron, Centre, Clearfield, Clinton, Lycoming, Potter, Snyder, Sullivan, Tioga, and Union in their entirety and that portion of Bradford County lying west of the Susquehanna River—a total of approximately 8900 square miles, with an extreme relief of over 2100 feet.

PHYSIOGRAPHY

The physiographic divisions of Pennsylvania are shown in Fig. 1. The rock strata of the Ridge and Valley Section have been sharply folded and subsequent erosion has cut away the softer limestones to produce a series of fertile valleys between ridges of quartzite and sandstone. At the western edge of this section, Bald Eagle Mountain extends in an unbroken arc from the Blair County line to the bend of the Susquehanna River at Muncy, but succeeding ridges, although following the general trend from southwest to northeast to east, interconnect in a complex zigzag pattern. The general level of the ridge increases from 1500-1600 feet in the north to about 2000 feet at the southern edge of our sector.

In the plateau province, the rock strata have remained approximately horizontal with gentle folding that diminishes to the west and north; the plateau surface lies at an elevation of 1700 to 2000 feet and slopes gently toward the southwest. The Allegheny Mountain Section is a highland belt through which numerous streams have cut deep, steep-sided valleys, between which the original plateau surface is present on the higher mountains. The High Plateau Section is a less deeply dissected area of rolling country with an average elevation in excess of 2000 feet in Potter County. The Glaciated Section of the plateau is also rolling country and slopes from 2000 feet in Potter County to 700 feet at the Susquehanna River in Bradford County. In the region as a whole, elevations range from approximately 400 feet in the Susquehanna Valley at the southeast corner to 2560 feet on Huckleberry Mountain in southern Sullivan County and 2565 feet in north-central Potter County. Local relief is greatest in the Allegheny Mountains Section.

Exposed rock strata range in age from the Ordovician limestones of Nippenose Valley in Lycoming County to the Allegheny formation which forms the plateau surface to the southwest and caps the highest areas in much of the rest of the plateau province. Pottsville and Pocono sandstones form the plateau surface to the north and east of Clearfield County; the Catskill and Chemung formations are exposed through the Glaciated Section, in the deep valleys of the Allegheny Mountains Section, and at the foot of the Allegheny Front, where they form a conspicuous belt of low pine-covered hills.

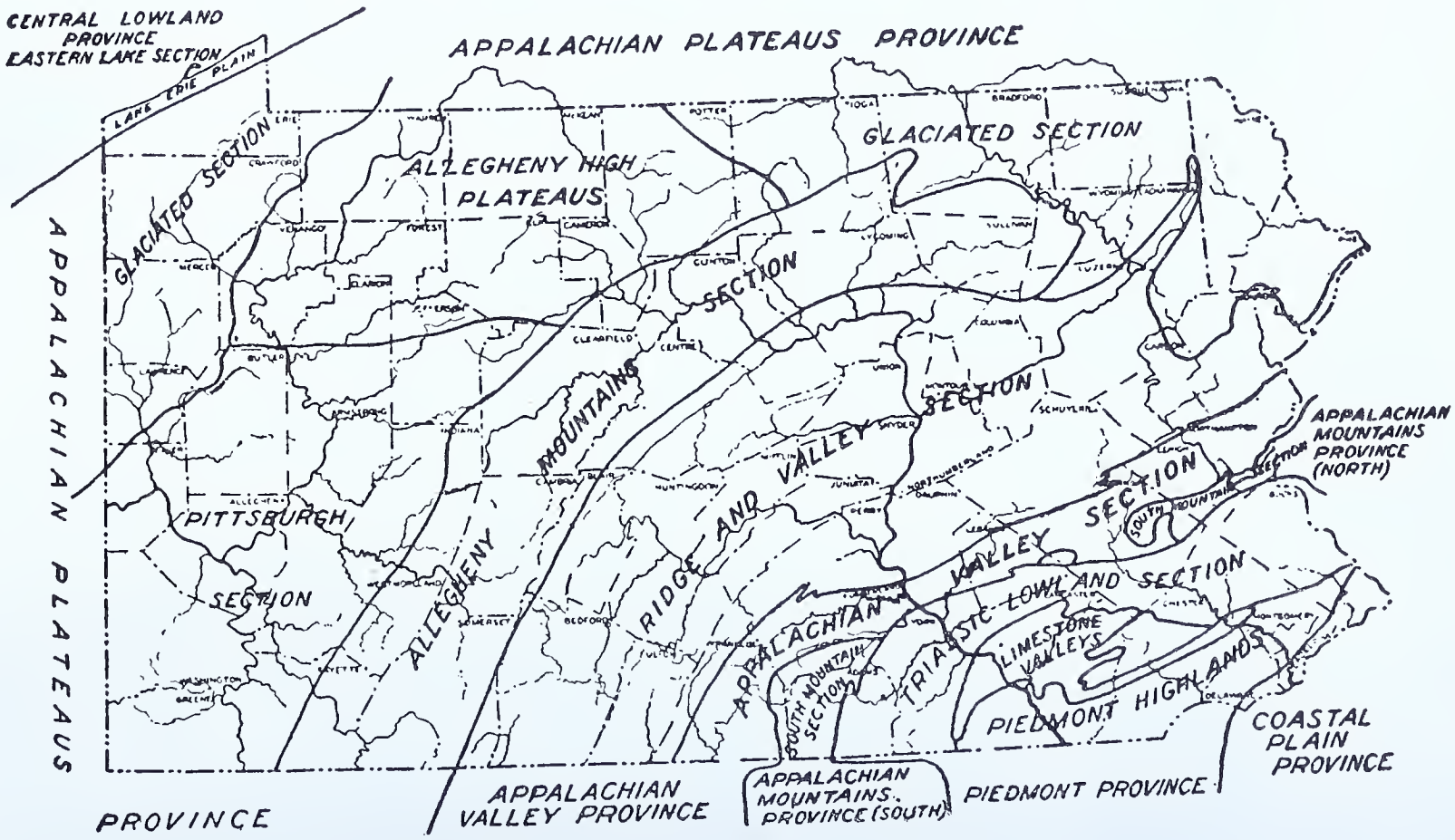


FIG. 1. PHYSIOGRAPHIC DIVISIONS OF PENNSYLVANIA

Wisconsin till deposits in the Glaciated Section are thin except in the valleys. Illinoian drift is present in northern and eastern Lycoming County, and still older drift occurs in White Deer and Buffalo Valleys and along Lycoming and Larrys Creeks in northern Union and southern Lycoming counties.

DRAINAGE

Approximately 100 square miles of north central Potter County drained by the Genesee River is part of the Great Lakes drainage basin. The Ohio River basin includes the northwest quarter of Potter County and the northwest corner of Clearfield County which are drained by the Allegheny River. With these exceptions, the region lies wholly within the Susquehanna River basin.

Swampy areas are found locally in all sections, but form a significant portion of the total area only in Sullivan County and the adjoining portion of Bradford County.

SOIL TYPES

The distribution of the major soil types of the region is shown in Fig. 3. Several locally important agricultural soils occur in areas too small to be mapped here; rough stony land, of which a large aggregate area exists, is likewise not indicated. The more extensive soil types are described briefly below.

Dekalb-Leetonia: Dekalb soils are developed from non-calcareous parent materials in areas with 35-40 inches of precipitation and a growing season of 130-150 days. A mellow gray to yellow layer, six to twelve inches deep, lies under a layer of matted organic material and over a yellowish to yellowish-brown subsoil which is heavier than the surface layer. Although usually too steep to farm, these soils are capable of growing good crops with fertilization. Leetonia soils are deeper, occur on the plateau surface, and are the productive soils of the Dekalb-Leetonia areas.

Muskingum-Lehew: These are shallow soils developed from gray (Muskingum) and red (Lehew) shales in areas of 40-50 inches of precipitation and 140-170 days growing season, and are of little agricultural value. These are the dominant soils of the rounded hills at the foot of the Allegheny Front and the valley ridges of the Ridge and Valley Section.

Rayne-Gilpin: Rayne soils are developed from sandstones and shales under conditions of 40-50 inches of precipitation and 130-150 days of frost-free weather. These deep (60 inches) soils exhibit five distinct horizons under a thin leaf litter. Gilpin soils are similar but thin and generally rocky.

Hagerstown-Frederick: These soils are derived from limestones in areas of about 40 inches of precipitation and a long (160 days or more) growing season. The surface layer is brown over a reddish brown, moderately heavy but permeable subsoil of clay loam and silt loam. These are excellent agricultural soils.

Lordestown-Volusia: Lordestown soils are of glacial origin and occur on the plateau and valley sides in areas of 30-40 inches of precipitation,

120-150 day growing season, and cold winters. A four-inch layer of dark yellowish-brown, mellow, topsoil overlies 20 inches of firm, fusable, yellowish-brown soil and about 12 inches of gray sandstone and shale till. Volusia soils develop from the same till on poorly drained benches and slopes and are characterized by a hardpan at 18 inches.

Lackawanna-Culver: These are weakly developed soils derived from reddish or purplish till in areas of 30-50 inches of precipitation, short summers, and long cold winters. Under a layer of organic material, the soil grades from a pinkish gray loam through pinkish brown gravelly subsoil to compact till to a total depth of 30-48 inches. Culver soils are the poorly drained members of the type.

Rough Stony Land: In this region, stony land with little or no true soil occupies an aggregate area greater than that of any except the Dekalb-Leetonia soils. Its plant cover ranges from dense hemlock and birch on well watered and shaded north and east exposures through brushy chestnut oak forest to widely scattered chestnut oak and black birch; areas completely devoid of trees or shrubs are a conspicuous feature of the mountainsides of the Ridge and Valley Section. A number of colluvial and alluvial soils on slopes and flood plains comprise the bulk of the best farm land of the region, although their total area is relatively small. In Lycoming County alone, fifteen series and forty types of soil are present.

CLIMATE

Within the region, the length of the growing season varies from less than 100 days in northeastern Potter County to 170 days in southern Lycoming County. The average annual precipitation ranges from 34 inches in Tioga County to 42 inches in Cameron, Clearfield, eastern Lycoming, and southern Sullivan counties. Mean annual temperatures are 46°F. at Coudersport, Potter County, and Wellsboro, Tioga County, 48°F. at Emporium, Cameron County, and 50°F. at Williamsport, Lycoming County. January and July mean temperatures at these stations are respectively: 24° and 67°; 24° and 69°; 26° and 70°; 28° and 73°F.

Local relief is responsible for marked differences in climate between the larger valleys and nearby highlands. Conditions in Rose Valley, for instance, approach those of Wellsboro 40 miles to the north more nearly than those of Williamsport ten miles south and 800 feet lower. Winter rains in the Williamsport area commonly result in heavy ice formation at altitudes above 1300 feet.

NATIVE VEGETATION

In north central Pennsylvania the transition from the southern oak forest to the northern hardwoods is marked roughly by the West Branch Susquehanna River. The oaks extend north of the river on dry ridges and southern exposures, while occasional stands of northern species are found in favorable sites to the south.

Two forest types—the chestnut oak type and the sugar maple-beech-yellow birch type—predominate and over a dozen other types, some of which occupy large areas, were noted in the course of the study. The

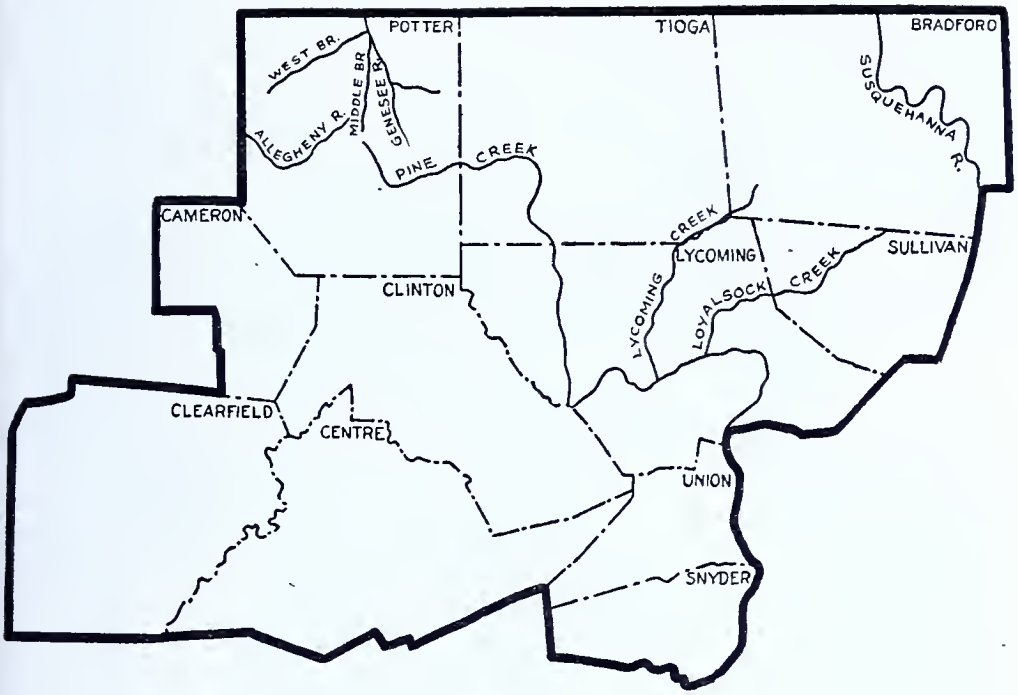
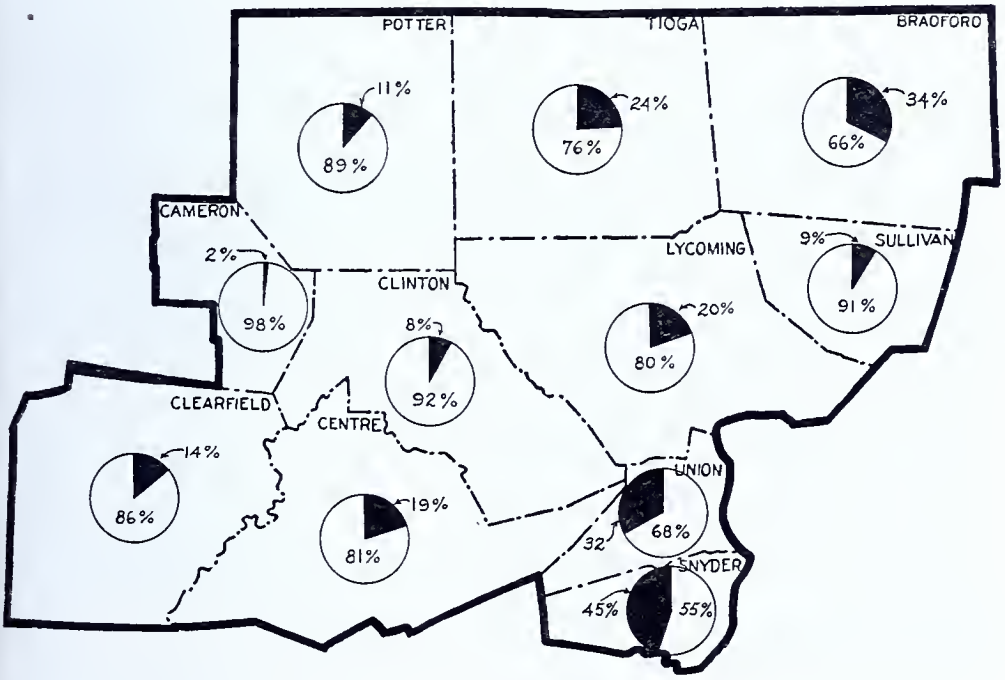


FIGURE 2. DRAINAGE



THE PERCENT OF CROPLAND IS INDICATED BY THE BLACK AREAS WITHIN THE CIRCLES.

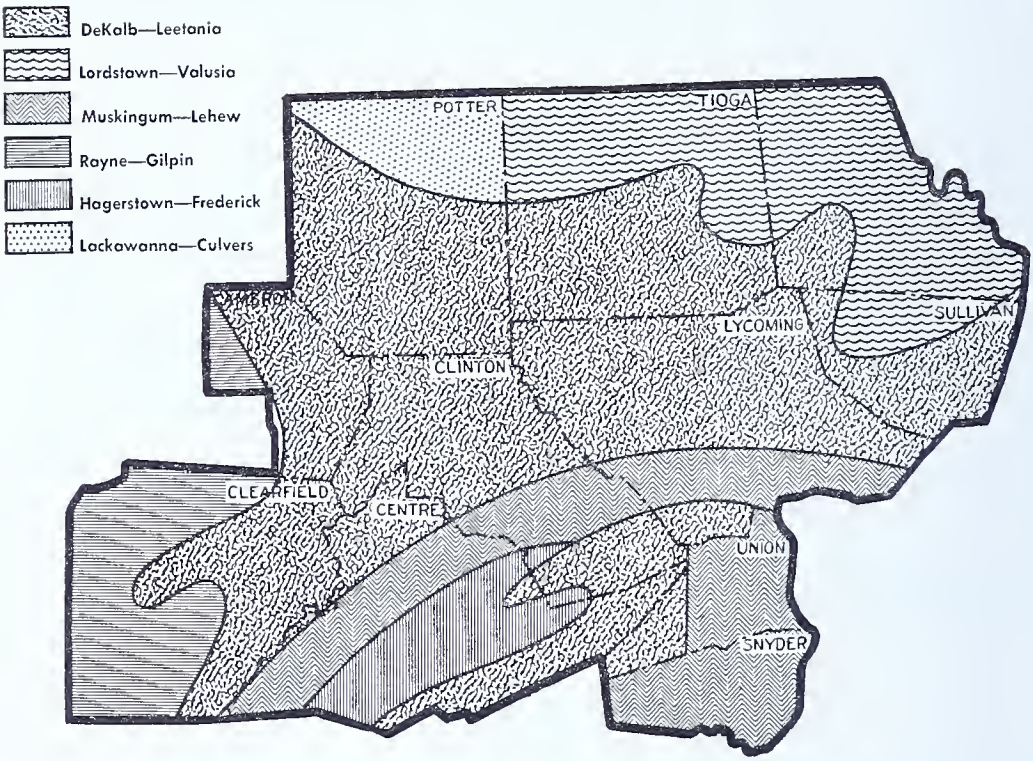


FIGURE 3. MAJOR SOIL TYPES

type names and type numbers used here are those of the Society of American Foresters, 1940.

The chestnut oak forest (Type 36 of the Society of American Foresters, 1940) occurs on dry, rocky, and thin-soiled sites. Chestnut oak (*Quercus montana*) may occur pure or in association with scarlet oak (*Q. coccinea*), white oak (*Q. alba*), black oak (*Q. velutina*), pitch pine (*Pinus rigida*), black gum (*Nyssa sylvatica*), chestnut (*Castanea dentata*), red maple (*Acer rubrum*), white pine (*P. strobus*), and red oak (*Q. borealis* var. *maxima*). Red or Norway pine (*P. resinosa*), reaches its southern limit in this region and occurs sparingly in the chestnut oak stands north of the river. In the absence of overbrowsing, a dense shrubby ground cover of blueberry (*Vaccinium*), laurel (*Kalmia latifolia*), azalea (*Rhododendron nudiflorum*), witch hazel (*Hamamelis virginiana*), and other species is developed. On the crests and upper slopes of the mountains of the Ridge and Valley Section and dry exposed sites to the north, this is a permanent type, but much of its present area was originally occupied by chestnut, red oak-chestnut, or white pine. In the better sites it is being succeeded by white pine.

The sugar maple-beech-yellow birch forest (Type 12) consists of these dominant species in varying proportions with smaller numbers of basswood (*Tilia americana*), red maple (*Acer rubrum*), hemlock (*Tsuga canadensis*), red oak (*Quercus rubrum* var. *maxima*), white ash (*Fraxi-*

nus americana), white pine (*Pinus strobus*), black cherry (*Prunus serotina*), tulip poplar (*Liriodendron tulipifera*), black birch (*Betula lenta*), paper birch (*B. papyrifera*), and other tree species. It occupies well developed loamy soils on well drained but not droughty sites throughout the plateau where it has succeeded the original white pine-hemlock-hardwood forest and is, in any one locality, remarkably uniform in age. Stands under fifty years of age are dense and have little undergrowth, but mature stands are characterized by a rich flora of spring plants, seedling trees of the dominant species and hemlock, and shade-tolerant shrubs. In our region, undergrowth is characteristically absent as a result of overbrowsing. The sugar maple-beech-yellow birch forest is self-perpetuating and succeeds other types wherever soil and moisture condtions are suitable.

The hemlock forest type (Type 11) occurs throughout the area in cool moist situations such as ravines and north slopes. Associated species are yellow birch (*Betula lutea*), basswood (*Tilia americana*), red maple (*Acer rubrum*), sugar maple (*A. saccharum*), beech (*Fagus grandiflora*), black cherry (*Prunus serotina*), white ash (*Fraxinus americana*), white pine (*Pinus strobus*), paper birch (*Betula papyrifera*), black birch (*B. lenta*), red oak (*Quercus rubrum* var. *maxima*), white oak (*Q. alba*), and others. This, or the somewhat similar white pine-hemlock type (Type 10), which differs mainly in the greater amount of white pine present, occurs also on cold poorly drained sites on the plateau where it is a conspicuous feature of the landscape. Normal development of the type has in many cases been greatly modified by pasturing.

Stands of yellow birch (Type 15) with admixtures of red maple (*Acer rubrum*), sugar maple (*A. saccharum*), black birch (*Betula lenta*), and paper birch (*B. papyrifera*), exist on stony north slopes and as narrow strips along trout streams. Dense thickets of *Rhododendron maximum* form the understory of most of these stands, particularly on the more stony sites, but a ground cover of tolerant deciduous shrubs and evergreen ferns is common where more soil is present.

The scarlet oak-black oak forest (Type 33) occupies large areas of the slopes below the chestnut oak stands of the region. Common associates are chestnut oak (*Quercus montana*), hickories (*Carya* sp.), pitch pine (*Pinus rigida*), black gum (*Nyssa sylvatica*), chestnut (*Castanea dentata*), black locust (*Robinia pseudo-acacia*), dogwood (*Cornus florida*), and white oak (*Q. alba*).

Bear oak (Type 35) occurs in large stands in Centre and Clinton counties and in smaller amounts elsewhere on repeatedly burned dry sites. It is a temporary type in which the dominant bear oak (*Quercus ilicifolia*) is eventually over-topped and shaded out by the associates, which include pitch pine (*Pinus rigida*), white pine (*P. strobus*), scarlet oak (*Q. coccinea*), black oak (*Q. velutina*), red oak (*Q. rubrum*), chestnut oak (*Q. montana*), black locust (*Robinia pseudo-acacia*), red maple (*Acer rubrum*), sassafras (*Sassafras albidum*), and black gum (*Nyssa sylvatica*).

In addition to these, the following forest types, some of which are locally quite important, are to be found in north central Pennsylvania: Type 5 (pin cherry), Type 7 (gray birch-red maple), Type 9 (white

pine), Type 14 (sugar maple), Type 14-A (black cherry), Type 37 (pitch pine), Type 49 (white oak-black oak-red oak), Type 51 (red oak-basswood-white oak), and Type 59 (river birch-sycamore).

LAND USE

Agriculture is the largest single source of income of the region; slightly less than half the total area is in farms, including farm woodlots, and about one-fifth is under cultivation. Cameron, Clearfield, western Clinton, central Lycoming, and central Sullivan counties comprise a subsistence farming area. Intensive dairy and general farming is the rule elsewhere in the region. Potatoes, truck crops, tobacco, seed corn, peas, snap beans, and apples are local specialties, but of these only potatoes are grown on a large scale. The principal small grains are oats and buckwheat in the northern counties and wheat, corn, oats, and barley in the south. Forage crops account for a large acreage in all sections.

Although pasture improvement, contour farming, and other conservation methods appear to be rapidly gaining acceptance, practices injurious to wildlife—pasturing of woodlots and submarginal land and fall plowing, for instance—are prevalent.

Abandoned farmland in all stages of reversion to forest is common but very little cropland has been taken out of cultivation during the last several years. Some clearing of brushy fields for potato production was observed in Potter County.

Within trucking distance of paper mills, the production of pulpwood is an important industry. At the present time all species except hickory are marketable. Arsenite "curing" of trees for the production of peeled wood during the winter promises to become a general practice, in which case the annual cut will be greatly increased.

Considerable saw timber is cut in the region. The eastern portion of the Allegheny Mountain Section and western Clearfield County are the more important producing areas. Chemical wood is cut to some extent in the northern counties when market conditions are favorable. Maple sugar and birch oil are forest products of minor importance.

Clearfield County is an important coal producer, and smaller quantities of coal are mined in other portions of the plateau. Coal is removed by strip mining wherever conditions permit; only a small fraction of the spoil banks are levelled. Mine drainage is responsible for the present sterile condition of the west branch of the Susquehanna River and numerous smaller streams.

A fine system of state parks and picnic areas and a privately developed resort area at Eagles Mere are the outstanding contributions toward the realization of the recreational potential of the region. In general, however, accommodations for tourists and vacationers are inadequate, and the prevalent belief that only big game and trout can attract outsiders to the region has discouraged sound exploitation of its scenic assets.

ECOLOGICAL DISTRIBUTION OF MAMMALS

The accompanying chart suggests the relationship of mammals to the growth form of plants, the presence of water, and specific soil conditions. A number of species not restricted by any known habitat factor—the foxes and the short-tailed shrew, for instance—and several species on which insufficient data were obtained, are not included here. The connotation of "edaphic" is here restricted to soil texture and that of "water" to streams, ponds, or other open water.

Some Ecological Factors Affecting the Local Distribution of Mammals

	Woods	*Brush*	*Grass & Weeds*	*Edaphic*	*Water*	*Special Factors*
Hairy-tailed mole .	—	—	—	X	—	
Star-nosed mole ...	—	—	—	—	—	Requires moist to saturated soils
Big-tailed shrew ..	—	—	—	X	—	
Water shrew	—	—	—	—	X	
Black bear	X	—	—	—	—	
Raccoon	X	—	—	—	—	
Mink	—	—	—	—	X	
Chipmunk	X	X	—	—	—	
Red Squirrel	X	—	—	—	—	
Gray Squirrel	X	—	—	—	—	
Flying Squirrel ...	X	—	—	—	—	
Beaver	—	—	—	—	X	Requires trees or brush in vicinity of water
Cloudland deer mouse	X	—	—	—	—	
Prairie deer mouse	—	—	X	—	—	
White-footed mouse	X	X	—	—	—	
Wood rat	—	—	—	—	—	Requires dry rocky sites
Red-backed mouse	X	—	—	—	—	
Meadow mouse ...	—	—	X	—	—	
Pine mouse	—	—	—	X	—	
Muskrat	—	—	—	—	X	Requires herbaceous plants in or near water
Meadow jumping mouse	—	X	X	—	—	
Woodland jumping mouse	X	X	—	—	—	Requires moist situation
Porcupine	X	—	—	—	—	
Varying Hare	X	—	—	—	—	
New England cottontail	X	X	—	—	—	
White-tailed deer .	X	X	—	—	—	

METHODS AND PROCEDURES

Field work was begun in November, 1948 and completed in September, 1950. Field stations were selected with the purpose of including as many ecological types as possible and obtaining as complete coverage of the region as time permitted. Intensive collecting was done at the localities listed elsewhere in this report.

Winter trapping was confined to areas accessible from Williamsport, Lycoming County. Part of the winter work consisted of interviewing trappers and fur dealers and a considerable number of specimens of skeletal material was obtained through their cooperation. Periodic inspections of field conditions in a number of representative localities provided much of the information upon which this report is based.

A representative series of mammals from each locality were prepared as museum skins and others were prepared as skull specimens. Standard data on all mammals taken, including those discarded, were recorded in the field catalogue. Ecological data were kept for each trapline and a daily record kept by each member of the party.

Ectoparasites were collected from most of the animals taken and a small number of endoparasites were preserved for study.

Digestive tracts of all carnivorous animals were preserved for food habit studies. Where any of the less common shrews were taken their digestive tracts and those of any of the common forms taken with them were preserved for study.

Localities Trapped

Trapline No.		*Date Trapped*
Bradford County		
41.	1 mi. N. of Alba	October 9—October 14, 1949
42.	1 mi. N. of Alba	October 11—October 26, 1949
43.	1 mi. N. of Alba	October 14—October 28, 1949
44.	1 mi. N. of Alba	October 24—October 28, 1949
45.	1 mi. N. of Alba	October 29—October 31, 1949
46.	3¾ mi. SE. of Canton	November 9—November 20, 1949
Cameron County		
40.	8 mi. NNW. of Emporium	August 25—September 29, 1949
Centre County		
28.	2¼ mi. SE. of Woodward	June 5—June 21, 1949
62.	2½ mi. E. of Snow Shoe	June 5—June 10, 1950
63.	2 mi. E. of Snow Shoe	June 11—June 16, 1950
64.	3½ mi. NNW. of Wingate	June 11—June 16, 1950
65.	3½ mi. NNW. of Wingate	June 24—June 30, 1950

Trapline No.		*Date Trapped*
66.	3½ mi. NNW. of Wingate	July 6—July 12, 1950
67.	3½ mi. NNW. of Wingate	July 6—July 12, 1950
68.	½ mi. SSW. of Wingate	July 6—July 8, 1950
69.	½ mi. SSW. of Wingate	July 5—July 14, 1950

Clearfield County

15.	McGees Mills	April 5—April 14, 1949
16.	4½ mi. N. of McGees Mills	April 7—April 24, 1949
19.	McGees Mills	April 26—May 7, 1949
20.	McGees Mills	April 26—April 30, 1949
21.	1½ mi. S. of McGees Mills	May 2—May 5, 1949
22.	¾ mi. SE. of McGees Mills	May 4—May 7, 1949

Clinton County

70.	9 mi. NNW. of Renovo	July 16—July 28, 1950
71.	9 mi. NNW. of Renovo	July 18—July 22, 1950
72.	9 mi. NNW. of Renovo	July 18—July 22, 1950
73.	9 mi. NNW. of Renovo	July 16—August 11, 1950
74.	9 mi. NNW. of Renovo	July 19—July 21, 1950, and retrapped August 22—August 28, 1950
75.	4¼ mi. NNW. of Renovo	July 30—August 18, 1950
76.	2 mi. S. of Cross Fork	July 31—August 6, 1950
77.	2 mi. SSW. of Cross Fork	August 1—August 6, 1950
78.	4¼ mi. NNW. of Renovo	August 1—August 4, 1950
79.	¼ mi. NW. of Hammersley Fork	August 22—August 27, 1950
80.	9½ mi. NNW. of Renovo	August 2—August 7, 1950

Indiana County

17.	4 mi. NW. of Glen Campbell	April 20—April 28, 1949
18.	4 mi. NW. of Glen Campbell	April 25—April 29, 1949

Lycoming County

1.	5 mi. NE. of Trout Run	November 26—November 29, 1948
2.	3 mi. NE. of Trout Run	December 12—December 15, 1948
3.	1 mi. S. of Duboistown	January 7—January 11, 1949
4.	1 mi. S. of Duboistown	January 7—January 11, 1949
5.	5 mi. SE. of South Williamsport	January 21—February 14, 1949
6.	South Williamsport	February 3—February 6, 1949
7.	1½ mi. E. of South Williamsport	February 19—February 21, 1949
8.	6½ mi. S. of Nisbet	March 4—March 13, 1949
9.	1½ mi. S. of Nisbet	March 15—March 18, 1949
10.	½ mi. E. of Nisbet	March 17—March 21, 1949
11.	½ mi. E. of Nisbet	March 20—March 23, 1949
12.	Duboistown	March 22—March 26, 1949
13.	2¼ mi. SE. of Trout Run	March 23—March 31, 1949
14.	1 mi. S. of Duboistown	March 28—April 1, 1949
23.	5 mi. SE. of South Williamsport	May 10—May 13, 1949
33.	1 mi. E. of Bodins	July 8—July 11, 1949

Trapline No.		*Date Trapped*
47.	4 mi. N. of Linden	January 11—January 15, 1950
48.	2 mi. E. of Salladasburg	January 11—January 15, 1950
49.	4 mi. NE. of Trout Run	January 16—January 26, 1950
50.	5 mi. NE. of Trout Run	January 20—January 25, 1950
51.	3½ mi. S. of South Williamsport	January 28—February 5, 1950
52.	3 mi. SW. of Montgomery	February 7—March 10, 1950
53.	3 mi. SW. of Montgomery	March 8—March 15, 1950
54.	3 mi. SW. of Montgomery	March 10—March 17 1950
55.	3 mi. SW. of Montgomery	March 12—March 17, 1950
56.	3 mi. SW. of Montgomery	March 16—March 17, 1950
	Potter County	
34.	4 mi. SW. of Ulysses	July 13—July 16, 1949
35.	6½ mi. S. of Ulysses	July 14—July 29, 1949
36.	5½ mi. SW. of Ulysses	July 31—August 7, 1949
37.	4 mi. WSW. of Ulysses	August 9—August 14, 1949
38.	7½ mi. SW. of Ulysses	August 12—August 18, 1949
39.	8 mi. NE. of Coudersport	August 15—August 18, 1949
	Sullivan County	
57.	4½ mi. SSE. of Hillsgrove	April 18—May 18, 1950
58.	4½ mi. SSE. of Hillsgrove	April 19—April 26, 1950
59.	4½ mi. SSE. of Hillsgrove	April 21—April 28, 1950
60.	4½ mi. SSE. of Hillsgrove	May 18—May 20, 1950
61.	2¼ mi. S. of Hillsgrove	May 21—May 26, 1950
	Union County	
24.	Glen Iron	May 13—May 20, 1949
25.	1 mi. S. of Glen Iron	May 14—May 19, 1949
26.	1 mi. S. of Glen Iron	May 23—June 2, 1949
27.	½ mi. S. of Glen Iron	May 26—June 2, 1949
29.	Glen Iron	June 14—June 18, 1949
30.	2¼ mi. W. of Laurelton	June 20—June 22, 1949
31.	½ mi. W. of Laurelton	June 21—June 25, 1949
32.	½ mi. W. of Glen Iron	June 26—June 29, 1949

CHECK LIST OF THE MAMMALS OF NORTH CENTRAL PENNSYLVANIA

Didelphia virginiana virginiana Kerr—Opossum
Parascalops breweri (Bachman)—Hairy-tailed Mole
Condylura cristata (Linnaeus)—Star-nosed Mole
Sorex cinereus cinereus Kerr—Masked Shrew
Sorex dispar Batchelder—Big-tailed Shrew
Sorex fumeus fumeus Miller—Smoky Shrew
Sorex palustris albibarbis (Cope)—Water Shrew
Microsorex hoyi thompsoni (Baird)—Pigmy Shrew
Cryptotis parva parva (Say)—Little Short-tailed Shrew
Blarina brevicauda brevicauda (Say)—Short-tailed Shrew
Myotis lucifugus lucifugus (LeConte)—Little Brown Bat
Myotis keenii septentrionalis (Trouessart)—Trouessart Bat
Myotis subulatus leibii (Audubon and Bachman)—Leib Bat*
Myotis sodalis Miller and Allen—Indiana Bat*
Lasionycteris noctivagans (LeConte)—Silver-haired Bat*
Pipistrellus subflavus obscurus Miller—New York Pygmy Bat
Eptesicus fuscus fuscus (Beauvois)—Big Brown Bat
Lasiurus borealis borealis (Muller)—Northern Red Bat
Lasiurus cinereus (Beauvois)—Hoary Bat*
Euarctos americanus americanus (Pallas)—Black Bear
Procyon lotor lotor (Linnaeus)—Eastern Raccoon
Martes americana americana (Turton)—Marten†
Martes pennanti pennanti (Erxleben)—Fisher†
Gulo luscus (Linnaeus)—Wolverine†
Mustela erminea cicognanii Bonaparte—Short-tailed Weasel
Mustela rixosa allegheniensis (Rhoads)—Least Weasel*
Mustela frenata noveboracensis (Emmons)—New York Weasel
Mustela vison vison Schreber—North Eastern Mink*
Mustela vison mink (Peale and Beauvois)—South Eastern Mink
Lutra canadensis canadensis (Schreber)—North Eastern Otter†
Mephitis mephitis nigra (Peale and Beauvois)—Eastern Skunk
Vulpes fulva fulva (Desmarest)—Red Fox
Urocyon cinereoargenteus cinereoargenteus (Schreber)—Gray Fox
Canis latrans Say—Coyote*
Canis lupus lycaon (Schreber)—Timber Wolf†
Lynx canadensis canadensis Kerr—Canada Lynx†
Lynx rufus rufus (Schreber)—Bobcat*
Felis concolor cougar (Kerr)—Panther†
Marmota monax monax (Linnaeus)—Woodchuck
Tamias striatus lysteri (Richardson)—North Eastern Chipmunk
Tamiasciurus hudsonicus loquax Bangs—Red Squirrel
Sciurus carolinensis leucotis (Gapper)—Northern Gray Squirrel
Sciurus niger rufiventer (Geoffroy)—Western Fox Squirrel
Glaucomys volans volans (Linnaeus)—Eastern Flying Squirrel
Glaucomys sabrinus macrotis (Mearns)—Northern Flying Squirrel

Castor canadensis canadensis Kuhl—Canadian Beaver
Peromyscus maniculatus nubiterrae (Rhoads)—Cloudland Deer Mouse
Peromyscus maniculatus bairdii (Hoy and Kennicott)—Prairie Deer Mouse
Peromyscus leucopus noveboracensis (Fischer)—Northern White-footed Mouse
Neotoma magister Baird—Wood Rat
Synaptomys cooperi stonei Rhoads—Lemming Mouse
Clethrionomys gapperi gapperi (Vigors)—Red-backed Mouse
Microtus pennsylvanicus pennsylvanicus (Ord)—Meadow Mouse
Microtus chrotorrhinus chrotorrhinus (Miller)—Rock Vole
Pitymys pinetorum scalopsoides (Audubon and Backman)—Pine Mouse
Ondatra zibethica zibethica (Linnaeus)—Muskrat
Mus musculus musculus Linnaeus—House Mouse
Rattus norvegicus (Erxleben)—Norway Rat
Rattus rattus rattus (Linnaeus)—Black Rat†
Zapus hudsonius hudsonius (Zimmerman)—Meadow Jumping Mouse
Napaeozapus insignis insignis (Miller)—Woodland Jumping Mouse
Erethizon dorsatum dorsatum (Linnaeus)—Porcupine
Lepus americanus americanus (Harlan)—Varying Hare
Sylvilagus floridanus mearsii (Allen)—Cottontail
Sylvilagus transitionalis (Bangs)—New England Cottontail
Odocoileus virginianus borealis (Miller)—Northern White-tailed Deer
Cervus canadensis canadensis (Erxleben)—Eastern Elk†
Cervus canadensis nelsoni (Bailey)—Western Elk (introduced)
Bison bison bison (Linnaeus)—American Bison†

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* Not collected by this Survey
† Extinct in this area.

DISCUSSION BY SPECIES

GAME AND FURBEARERS

WHITE-TAILED DEER

(Odocoileus virginianus borealis)

DISTRIBUTION. Common to abundant in all areas.

HABITAT. Forest and brush. Utilizes open fields in feeding.

NOTES. During the spring and summer months deer feed mainly on herbaceous plants and the leaves and new twigs of woody species. Acorns and beechnuts are the preferred fall and winter food and are utilized as long as the supply lasts; extensive browsing of woody twigs does not begin until other food is scarce.

Oak, maple, dogwood, viburnum, tulip, apple, aspen and rhododendron are usually the most heavily browsed species in areas where selection is possible. In such areas mountain laurel, hemlock, black gum, and blueberry are ordinarily lightly browsed and beech, birch, and sweet fern may be untouched. In most of north central Pennsylvania, however, the deer herd is at present consuming every bit of available browse of all species.

The result of continued overbrowsing is especially striking in mature stands of sugar maple-beech-yellow birch forest type.

In the absence of overbrowsing, these forests are characterized by a dense ground cover of spring plants and a growth of seedling trees which limit visibility to a few yards during the summer; birch and hemlock seedlings are found growing on most of the rotting stumps and logs, and the soil is loose and mellow. Illick and Frontz in 1928 reported 100,000 young trees ranging up to six feet in height on one acre of a mature Potter County stand and over 200,000 smaller seedlings per acre on a sixty year old stand also in Potter County. The conditions described by Illick and Frontz no longer exist in any areas to which deer have free access. Woody plants under six feet in height are represented today only by seedlings small enough to be completely covered by snow during the winter, and in most of the region even these are scarce since most of them are consumed by deer during the summer. Stumps and logs are free of young trees except for those that were already above the reach of deer when overbrowsing began. Caking of the soil in dry weather is common. Many species of herbaceous plants have been eliminated from large areas with the result that in extensive woodlands food shortage is a year-round problem. Complete utilization of spring plants is the rule until twig growth from buds of woody stems that are too tough to be browsed appears. By late spring this is exhausted and herbaceous plants are again for a short time the only food available in the woods. In mid-July sugar maple-beech-birch stands are commonly completely bare of food. State Game Lands 14 in Cameron County, State Game Lands 30 in McKean County, the Buckseller Run area near Brookland and the Hammersley Fork Run area in Potter County, and the Ogdonia Creek area in Sullivan County are prime examples of overbrowsing in this forest type.

Overbrowsing of the pin cherry forest type severe enough to interrupt the normal forest succession and result in reversion to grassland is not common in the region only because of the small extent of this forest type.

In the various oak forest types, except scrub oak, overbrowsing results in total or partial elimination first of tree seedlings followed by some of the herbaceous plants and many shrub species, and finally such shrubs as laurel, blueberry, and huckleberry. Poverty grass and dry soil sedges take over the forest floor as competing plants are removed, but a few shrubs persist under the worst conditions so that the completely bare forest floor characteristic of long abused sugar maple-beech-yellow birch forests does not develop in the oak types.

The scrub oak forest type of this region suffers little deer damage since bear oak is relatively immune to injury through overbrowsing because of the toughness of its twigs and its sprouting ability. It is possible that the life span of this temporary forest type is lengthened through the suppression or destruction of seedlings of taller growing tree species all of which are more susceptible to deer damage than is bear oak.

Under present conditions, sound forestry practices cannot be put into use in most of this region. Plantations of all species of forest trees are liable to deer damage which often amounts to complete destruction. Selective cutting of saw timber frequently results in the creation of openings in which grass, hay-scented fern, or other deer proof plants

survive. An extreme example of this may be seen in Wyoming State Forest along Ogdonia Creek near Hillsgrove, Sullivan County. Here old trees were removed from a sugar maple-beech-yellow birch stand about twelve years ago but not a single tree seedling has survived to grow to a height of one foot. Reproduction on clear cut areas is less severely affected; however, the species composition of the resulting forest may be greatly influenced by the food preferences of deer.

The critical condition of our deer range is not generally appreciated for several reasons. One of these is that the dense growth of brush along most of our highways conceals the barren forest floor behind it and creates an illusion of plenty. Lightly travelled roads, such as State Route 144 between Moshannon and South Renovo, and the approach to High Knob Overlook and Loyalsock Canyon Vista in Sullivan County, however, offer car window views of conditions that are generally to be seen only along unsurfaced roads.

Most of the considerable areas of brushy forest present in all sections of the region owe their continued existence to the fact that deer cannot inhabit them continuously through the winter. At temperatures as high as 20°F, deer seek shelter from even low winds although subzero temperatures have little or no effect on activity in calm weather. During periods of deep snow, deer seek sheltered areas and stay there until free movement is again possible. Very steep and extremely rocky areas are generally avoided, particularly when these are covered with snow. The mild winters of 1948-49 and 1949-50 permitted extensive utilization of these ordinarily inaccessible brushy areas with the result that starvation losses were held at an absolute minimum and the false impression of adequate winter food supply was strengthened.

That the absence of undergrowth is regarded as a normal and natural forest condition by many residents who have seen pole-stage woods approach maturity, and that abundant reproduction is generally believed to be associated only with clear cutting, or fire, reflect the chronic nature of overbrowsing in this region. Yew appears to have disappeared unnoticed from vast areas, and rhododendron is currently being destroyed without provoking comment.

Also contributing to the belief that browse is still plentiful is the widely held notion that hemlock and mountain laurel are choice and nutritious foods. Both of these species are utilized to a limited extent when a wide choice is possible, but only when other foods are not available do they make up the bulk of the diet. Heavy browsing of these, and of birches, beech, and sweet fern as well, is, in this region, an indication of severe food shortage.

A small group of plants possessing the characteristics of general availability, palatability, and tolerance of repeated cropping are worthy of special mention.

The contribution of grasses and sedges to the support of the deer herd has received little or no attention. In many sections, new growth of these plants is kept completely eaten off until spring is well advanced. Heavy grazing is common in all areas during the fall and, conditions permitting, during the winter. After the drought of June-August 1949, large numbers of deer were attracted to pasture fields. Grasses and sedges are taken only when in succulent condition and so suffer little permanent damage or loss of seed production.

The rough-stemmed goldenrod (*Solidago rugosa*) provides a great quantity of food from May until September. It is particularly valuable during periods of drought when utilization may be so general that only a few stems are able to produce flowers. This species spreads by underground runners and forms large patches that remain thrifty except when severely browsed for years. Silverrod (*Solidago bicolor*) and the wreath goldenrod (*Solidago caesia*) although palatable are of slight value because of their inability to survive repeated cropping. The field goldenrods (*Solidago juncea* and *Solidago nemoralis*) are not eaten, and the flat-topped goldenrod (*Solidago graminifolia*) is rarely taken.

New Jersey tea (*Ceanothus americanus*) is remarkably resistant to year-round browsing. The phenomenal recuperative power of this very palatable plant is probably due in large measure to its heavy deep root system.

The shield ferns (*Dryopteris intermedia* and *D. marginalis*) the Christmas fern (*Polystichum achrostichoides*) and the rock polypody (*Polypodium vulgare*) in this region are eaten off during the spring, summer, and fall and provide a large proportion of the herbaceous food available under the closed canopy. Although already largely destroyed, a slight reduction in the amount of spring and summer browsing would permit these plants to become the important winter foods that they are in, for instance, Venango County.

No estimates of the cash value of crops damaged or destroyed by deer are available and no method of accurately determining it has been devised. It is practically impossible to measure such items as loss of fruit production from low hanging branches, shattering of soybeans and grains attributable to deer, and other types of damage that are seldom mentioned in damage complaints. Winter grains suffer from both grazing and trampling during winter thaws; ripening and shocked buckwheat, clover, and shocked corn are often severely damaged. Potato plants are cropped and trampled and the tubers pawed out of the ground. Kitchen gardens are frequently destroyed in a day. Our impression is that the actual damage due to deer is much greater than the number of complaints would indicate.

Deterioration of bloodlines as a result of inbreeding is generally believed by hunters to be responsible for the small size and poor antler development of the deer in many areas of north central Pennsylvania. Sentiment favoring the importation of new breeding stock is common and persists in spite of general awareness of the greater average size and superior antler development of animals from agricultural areas as contrasted to those from extensive forest areas. Few people appear to be inclined to consider the effect of near-starvation of the doe on the vigor and size of the offspring and on her physical condition, or the effect of an insufficient supply of high quality food on the subsequent development of the fawns. Natural reduction of the deer herd occurs after physical deterioration has become common. Further decreases to bring the population in line with the true capacity of the range have, to date, been successfully opposed. The mere fact that deer survive in their present numbers amply attests the hardiness of the Pennsylvania whitetail.

The bear, porcupine, raccoon, and the foxes prosper in overbrowsed situations. None of these species is subject to predation or obliged to

compete with the deer for food. It is significant that all of them are among the few forms that have maintained or increased their numbers in recent years. The snowshoe hare and the cottontail, which depend upon herbaceous and low woody plants for both food and cover, are conspicuously absent from overbrowsed woods or, at best, are scarce. The woodchuck also disappears from these areas and squirrels are consistently less plentiful than they are elsewhere.

The white-tailed deer, in danger of extinction fifty years ago, responded so well to protection and ideal habitat conditions that, for the past twenty-five years, its management has been Pennsylvania's most difficult wildlife problem. Since the establishment of the first refuges in 1905, the brush that covered much of the state at that time has developed into forest trees sixty feet or more in height beneath whose shade only a limited amount of deer browse can be produced. There is today no prospect of a repetition of the wholesale lumbering activity that created, nor of the recurrent fires that maintained, such vast expanses of brush. The problem of managing the deer herd becomes a matter of balancing the number of animals against the food supply.

Unfortunately, the "Pennsylvania Deer Problem" is a complex of which the welfare of the herd is only one component. Sheer sentiment against the harvesting of surplus antlerless animals continues to be one of the major obstacles to sound management in spite of the sentimentalist's indignation at starvation losses. Opposition to any change of the status quo is, in many instances, based upon economic considerations. The tremendous volume of deer season business is particularly important to restaurants, taverns, gasoline stations, hotels, and individuals who take in hunting parties as lodgers. The reputation of being located in good deer country is zealously defended. Less publicized, but also important in crystalizing opposition to proper balancing of the herd, is the exploitation of the crop damage provision of the game law and the general attitude that the country resident has a moral right to a piece of venison at any season. Farmers whose crop losses substantially exceed the meat value of a deer or two are almost unanimously in favor of drastic reduction of the number of deer.

Hunters, accustomed to an abundant supply of game, are reluctant to admit that it cannot be maintained. In spite of general participation in antlerless deer seasons, faith in such early management measures as the buck law, restocking, wildcat control, and refuge maintenance remains undimmed. Suggestions that the herd be held within the present capacity of the range are vigorously opposed.

The obvious solution to the problem of overbrowsing is sufficient reduction of the deer herd to permit successful forest reproduction. When this has been achieved, improvement in the quality of the deer, an increased supply of other species of forest game, and a reduction of crop damage can be expected. It is entirely possible that the virtual elimination of deer for several years may be required for initial recovery of the range in areas where the population is already low, but still consuming all available food. The period required for substantial recovery must be determined by observation and the deer population regulated to prevent the recurrence of overbrowsing.

ELK

(Cervus canadensis nelsoni)

DISTRIBUTION: Western Cameron County and eastern Elk County.

NOTES: Although 118 elk were introduced into several counties of north central Pennsylvania in the years 1913 to 1926, only one herd remains today. The following notes were supplied by Stanley E. Forbes (Leader of PR-31-R) and are based for the most part on information received from District Game Protectors of Elk and Cameron Counties, where 34 western elk were released.

District Game Protector Norman Erickson estimates that there are 35 to 40 elk that range primarily in the southern part of Shippen Township, Cameron County. Included in this area is State Game Lands #14. In this herd there are at least 12 mature bulls. During 1950, at least two calves were born that were raised and were still alive at the end of the year.

District Game Protector Daniel Russ estimates that there are approximately 12 elk that range over a portion of northern Bennezette and southern Benzinger townships in Elk County.

The entire present range of the elk is an area of approximately 50 to 60 square miles on the Cameron-Elk county line, south of U.S. Highway 120, between Emporium and St. Marys. Occasionally single elk are reported outside of this area, but these are apparently wandering individuals.

The number of elk appears to be slowing increasing. The major factor in preventing more increase has been the shooting of these animals in mistake for deer.

BLACK BEAR

(Euarctos americanus americanus)

DISTRIBUTION. Found in all counties, but most numerous in the Allegheny Mountain section.

HABITAT. Forest.

NOTES. The north central sector accounts for more than half of the annual bear kill of the state. Centre, Clearfield, Snyder, and Union counties contribute only a small proportion of the total for the region. As a rule the remaining seven counties produce as many bear as the other sixty counties of Pennsylvania. The "bear country" is the largest heavily forested and also the most rugged area of the state.

The bear climbs for acorns and beechnuts as soon as they ripen and thus avoids having to compete with the deer while building up its fat reserve. During the spring and summer, it appears to spend much time seeking out such ridiculously small tidbits as salamanders and insect larvae between heavier meals of ants, berries, or carrion. In the fall, feeding is concentrated on wild grapes, mast, corn, or other foods which

are available in quantity. Apples are a favorite food as the clawed trunks and broken branches of producing trees amply attest.

In addition to being the most highly prized game animal of the state, the black bear is an economic asset of no mean proportions to the communities within its range. The total cost of bear damage claims for a year (average approximately $2600 for 1942-48) is less than the increase in business volume on the eve of bear season in any one of a dozen communities.

Certain areas have long been recognized as being denning country while other areas are reputed to be visited by bears only at certain seasons. At intervals of several years a bear is reported travelling westward through southwestern Clearfield and northern Indiana counties. Reports of bear in the White Deer Valley are most commonly of individuals crossing from North White Deer to South White Deer Mountains in the fall. In the areas in which bears are most numerous it is difficult to trace the route of any one individual. Food conditions are generally credited with being the prime factor in bear movements in such areas.

Most Pennsylvanians are surprised to learn that the bear is still classed as vermin in some parts of northeastern North America. Certainly there is no better example of the fact that the estimate of the sporting value of any species may be too often colored by prejudice.

One of the specimens obtained was given to us by District Game Protector Morningstar who had been called to dispose of a sick bear wandering around a farm. The bear was extremely emaciated. Its tongue was grossly infested with nematodes. These were identified as *Gonglyonema pulchrum* Molin (Chandler 1950).

SPECIMENS COLLECTED. Total: 3—Centre 1, Lycoming 1, Sullivan 1.

VARYING HARE

(Lepus americanus virginianus)

DISTRIBUTION. Locally through the Allegheny Mountains section and Allegheny High Plateaus.

HABITAT. More common in forest and swamps with dense undergrowth, but occasionally found in rather bare woods.

NOTES. Along the Allegheny Front, the snowshoe or "white rabbit" is restricted to isolated, high, cold, laurel thickets and steep, heavily-forested slopes. Northward its distribution is less irregular, and it is occasionally found in rather badly overbrowsed woods as well as in swamps and brushy woods.

The elimination of brush from the forest by shading and browsing has been the major factor in reducing the snowshoe to its present low numbers on the plateau. There appears to be little hope for a substantial increase until habitat conditions are improved. At the present time, a minor increase in numbers is reported in all sections.

In spite of its relative scarcity, the snowshoe continues to furnish sport for many hunters. Hunting pressure appears to be a minor factor in preventing its general increase.

Many rough, brushy areas in the Ridge and Valley section, from which snowshoes are now absent, appear to be well suited for this species.

SPECIMENS COLLECTED. Total: 1—Tioga County.

COTTONTAIL

(Sylvilagus floridanus mearnsii)

DISTRIBUTION. Occurs in all counties.

HABITAT. Brushy fields and recently cut-over forest are the best cottontail cover in this region. Brushy woodland and thickets are good habitat. Few cottontails are found in overbrowsed forest.

NOTES. Although interest in rabbit hunting is not so general as it is elsewhere in the state, hunting pressure is heavy in all areas easily reached from the urban centers along the West Branch and in the vicinity of towns and villages throughout the region.

The combination of brush, weeds, and grasses that produces the best cottontail cover is most often developed on recently abandoned farmland; consequently good cottontail hunting is confined chiefly to the agricultural areas of the region. However, on many of the dairy farms there is no good rabbit cover as a result of the close grazing and clipping of permanent pasture, pasturing of aftermath and woodlots, and the elimination of fencerows in favor of electric fencing. Fall plowing and the discing down of corn stalks, also reduce the amount of available cover.

At the present time, the acreage of brushy cut-over forest is rapidly increasing in most of north central Pennsylvania and promises to offset the effects of increasingly intensive farming. Relatively large cottontail populations are found in this type of cover. In northern Potter County it affords the only good rabbit shooting.

Old fields of poverty grass (*Danthonia spicata*), sweet fern (*Myrica asplenifolia*) and goldenrod (*Solidago nemoralis, S. juncea,* and *S. graminifolia*) lack food plants and produce few rabbits, but do furnish good cover and, when located near a source of food, provide fine hunting.

In the Ridge and Valley section a few cottontails are found even on the crests of the ridges and good hunting is reported locally along their lower slopes. In the valleys, the type and intensity of farming determines the number of cottontails.

No indication of the presence of cottontails was found on the high isolated, chestnut oak-laurel areas above Rose Valley in Lycoming County where the snowshoe hare still persists in small numbers. These areas are well provided with brushy cover but lack both herbaceous plants and woodchuck burrows. No badly overbrowsed forest area was found to support an appreciable number of cottontails. In most cases no cottontails were noted in these areas.

Moderate to heavy hunting pressure in brushy, abondoned pasture-land and cropfields near Alba, Bradford County during the open season of 1949 did not seriously reduce the number of cottontails although most of the hunters interviewed here considered their bags satisfactory. A check of the area after a light snow at the end of the season revealed that practically every woodchuck hole present had been used by cottontails. Observations on the Susquehanna Ordnance Sub-Depot during February and March, 1950, indicate that the presence of woodchuck burrows may be necessary to the maintenance of a high cottontail population even where other conditions are optimum. In this area, cottontails took shelter in woodchuck holes during periods of sustained high winds, extreme cold, and cold rain although dense vegetative cover was abundant. On many such days, no rabbits were found in areas in which as many as a dozen were dependably located during fair weather.

The ordnance area was one of productive farms prior to 1942. Records of the number of cottontails removed by hunting and live trapping are not available but the peak of productivity appears to have been reached before 1947. Many fields which have passed into the goldenrod stage support fewer rabbits at present than do the aster fields and woods. Rabbits are most numerous in areas of grass and brush, especially about former farmsites.

Cottontails in Rose Valley were observed to be feeding extensively on blackberry canes in early January 1950, but on the ordnance area where grasses and other herbs were available, barking and twigging did not begin until snow had covered other foods.

SPECIMENS COLLECTED. Total: 55—Bradford 14, Cameron 3, Centre 3, Clearfield 3, Clinton 2, Lycoming 26, Potter 2, Sullivan 1, Union 1.

NEW ENGLAND COTTONTAIL

(Sylvilagus transitionalis)

DISTRIBUTION. Probably occurs in all counties.

HABITAT. Forest and brush.

NOTES. Except that it does not venture far into open country, the New England cottontail does not appear to differ in habits or habitat from the common or Mearns cottontail, and the two live in apparent harmony where *transitionalis* is found. The dense brush that follows pulp and chemical wood cutting appears to be the optimum cover in this region. In the potato and dairy country of northern Potter County where *transitionalis* is common the best rabbit hunting is found in such areas.

Rabbit hunters in many sections speak of "little bluebellies" and "big gray, woods-rabbits," but these terms do not appear to have any taxonomic significance. In some specimens of *transitionalis* the belly fur has a distinctly bluish cast, but the "bluebelly" is most often described as inhabiting fields and is probably an immature Mearns cottontail

The "big, gray, woods-rabbit" probably also refers to the latter species. Our specimens of *transitionalis* are all within the lower weight range of Mearns cottontail.

SPECIMENS COLLECTED. Total: 9—Bradford 1, Centre 1, Clinton 1, Potter 4, Union 1, McKean 1.

GRAY SQUIRREL

(Sciurus caroliuensis leucotis)

DISTRIBUTION. Occurs in all counties.

HABITAT. Forest and woodlot.

NOTES. Gray squirrels may be expected wherever a few large trees are present to provide dens, but large numbers are invariably associated with an abundance of such foods as nuts, acorns, or field corn.

The black oak-scarlet oak forest type appears to be the best squirrel habitat in the region as a whole, but the largest local population observed was in mature sugar maple-beech-yellow birch woods with a large admixture of hemlock. In the latter locality (near Alba, Bradford County) other forest types and pasturefield groves also were generally well populated. Chestnut oak woods on the crests of Bald Eagle, North White Deer, and South White Deer mountains are practically without squirrels during the winter months, apparently because of the frequency of ice glaze. In all overbrowsed areas gray squirrels were found to be scarce.

In the Alba area it was noted that gray squirrels, when surprised in deciduous stands, generally ran through the trees to take shelter in a cavity or leaf nest. In mixed stands they resorted to the nearest hemlock or pine.

Few hunters in this region are interested primarily in squirrels and hunting pressure is light except in the immediate vicinity of towns and villages.

The black color phase does not occur generally but has roughly the same distribution as the main body of the sugar maple-beech-yellow birch forest in this region.

SPECIMENS COLLECTED. Total: 48—Bradford 21, Cameron 1, Centre 2, Clinton 2, Lycoming 13, Potter 2, Snyder 1, Sullivan 3, Union 3.

FOX SQUIRREL

(Sciurus niger rufiventer)

NOTES. Repeated efforts at establishing the western fox squirrel in all sections of the region have met with failure. A shootable population is reported from scattered Centre County localities. One specimen was found dead on the highway near Jersey Shore, Lycoming County.

RED SQUIRREL

(Tamiasciurus hudsonicus loquax)

DISTRIBUTION. Occurs in all counties.

HABITAT. Wooded areas generally; dense-crown growth, such as is provided by conifers, hawthorn and crabapple thickets, grape vines, and neglected fencerows, is preferred to open and shallow-crowned woods.

NOTES. At the present time, red squirrels are quite scarce in most of the north central sector. At Alba, Bradford County, a large red squirrel population was found living in apparent harmony with gray and flying squirrels in a mature hemlock-hardwood stand. Stone piles, woodchuck burrows, and other subterranean retreats are commonly used for food storage and as escape cover; when hollow trees are not available for the purpose, a nest of fibrous bark serves as home.

Acorns, nuts, cones of pine and hemlock, and witch hazel fruits are stored in the ground or in hollow trees; at Glen Iron, Union County, stored walnuts were still being eaten at the end of June, 1949. In Rose Valley, Lycoming County, during the winter of 1948-49, red squirrels were found feeding on the carcass of a deer.

SPECIMENS COLLECTED. Total: 72—Bradford 31, Center 2, Clinton 2, Lycoming 24, Potter 2, Union 11.

WOODCHUCK

(Marmota monax monax)

DISTRIBUTION. Occurs in all counties.

HABITAT. Found in all well drained situations, both wooded and open.

NOTES. Woodchucks are most numerous where both succulent food plants and overhead cover such as brush, rank weeds, or tall grass are present in areas in which underground burrows are not subject to flooding. Few or none are found in swamps, marshes, and overbrowsed forest. Rocky slopes and unbrowsed woodlands support fair numbers of chucks, and large populations are common in weedy bottomlands, hardwood slashings, and farm lands.

The food of the woodchuck consists of tender leaves and growing tips of plants. Legumes, dandelion, plantains, and Sweet Cicely are among its favorites. Corn in the milk stage is relished, and low eared varieties such as sweet corn frequently suffer extensive damage. Small gardens are often completely destroyed by woodchucks, and burrows in cultivated fields may cause considerable damage to farm equipment.

Woodchuck hunting with specialized rifles, loads and optical equipment is increasingly popular, but hunting pressure appears to have little effect on the total population, probably because few animals are

removed from brushy cover. Dogs probably kill many more groundhogs than do hunters.

Burrows that were originally dug by woodchucks serve as dens for most of our furbearers and as havens from pursuit and bad weather for the cottontail.

SPECIMENS COLLECTED. Total: 39—Cameron 2, Centre 10, Clinton 1, Indiana 3, Lycoming 9, Potter 8, Sullivan 4, Union 2.

RACCOON

(Procyon lotor lotor)

DISTRIBUTION. Occurs in all counties.

HABITAT. Forest, forest edge, and swamp.

NOTES. The raccoon prefers large hollow trees, rocky ledges, and rock slides for denning, but a remodelled woodchuck burrow is quite acceptable as a home and an abandoned crow's nest will serve when better accommodations are lacking.

During the summer and fall the coon "follows the harvest," feeding on whatever fruit is in season. Strawberries, raspberries, blackberry, June berry, blueberries, cherries, and pokeberry, when available in sufficient quantity, are often the only food taken for days at a time. Corn and buckwheat are eaten from the time the grain is well formed until hauled from the field, and wild grapes, acorns, and beechnuts as long as they last. Animal food is always welcome; insects, crayfish, frogs, snakes, fish, mussels, eggs, birds, and mammals are taken with relish.

In this sector, raccoons are common to abundant in all areas. The present low fur value (about $1.00) discourages trapping and, to some extent, hunting. In localities where porcupines are numerous, relatively little coon hunting with dogs is done.

CONTENTS OF 4 RACCOON STOMACHS
(collected Dec., Jan., Mar.)

Food	*Percent of Occurrence*
Carrion (bait?)	50
Insects	50
Bird	25
Microtus	25
Salamander	25
Corn	25

CONTENTS OF 8 RACCOON STOMACHS
(collected May, June, July)

Food	*Percent of Occurrence*
Insects, spiders, centipedes	100
Fruits, (blackberry, strawberry, cherry, Juneberry)	87.5
*Deer	25
Squirrel	12.5
*Chipmunk	12.5
Bird	12.5
Snake	12.5
Frog	12.5
Crawfish	12.5
Snail	12.5

* Carrion.

SPECIMENS COLLECTED. Total: 19—Cameron 3, Centre 2, Clinton 5, Lycoming 4, Potter 2, Sullivan 2, Tioga 1.

OPOSSUM

(Didelphis virginiana virginiana)

DISTRIBUTION. Occurs in all counties.

HABITAT. Brushy fields and woods, streamside situations, and farmland are preferred to extensive forests, but occasional individuals are likely to be found anywhere.

NOTES. In the northern counties of the region the opossum is now more numerous than it has ever been in the past, but this population is small in comparison with the normal number of opossums to be found in the southern counties. Although some residents of the northern tier maintain that it has only recently appeared on the local scene, others remember having seen an occasional opossum many years ago.

In the Williamsport area, the ears and tails of opossums are subject to frostbite. Practically all adult animals are stub-tailed. It may be that a succession of winters of less than average severity is responsible for the increase in the numbers of this species in the north. A slight increase in the southern counties is best explained by lack of trapping pressure due to the current low price ($ .35) of the fur.

Insects, fruits, grains, carrion, earthworms, and snails are important foods and are taken without apparent discrimination. Birds' eggs or young, young mammals, etc., are eaten as available, but the opossum is neither a thorough nor a skillful hunter, and it is probably to be condemned more as a nuisance to trappers, coon hunters, and poultrymen than as a game predator, except possibly in ringnecked pheasant cover.

In the course of this study, opossums were found denning in brush piles, hollow logs and trees, junk heaps, and stopped-up culverts, as well as in the standard shelter, woodchuck holes.

SPECIMENS COLLECTED. Total: 52—Cameron 1, Centre 3, Clinton 2, Lycoming 43, Union 3.

BEAVER

(Castor canadensis canadensis)

DISTRIBUTION. Probably occurs in all counties, but none has been trapped in Snyder County since 1945, when one was taken.

HABITAT. Stream and swamp with brush and trees.

NOTES. The actual date of extermination of the original beaver population of Pennsylvania has been fixed as 1913 by Col. Henry W. Shoemaker, but the species was already rare in Civil War times. Its re-introduction during 1917-1920 was so successful that by 1934 an open season was declared, and in recent years the number of pelts taken has average over 2000 annually.

In addition to its fur value, the beaver provides nesting areas for ducks, and some abandoned dams and beaver meadows are taken over by muskrats.

SPECIMENS COLLECTED: Total: 4—Lycoming 3, Tioga 1.

MUSKRAT

(Ondatra zibethica zibethica)

DISTRIBUTION. Occurs in all counties.

HABITAT. Shoreline and marsh. Rocky or gravelly fast-flowing streams, and acid lakes or ponds with brushy shores are unsuitable. Slow-moving streams and back-waters are the important muskrat habitat of the area.

NOTES. In this region the muskrat is common in the streams of the agricultural areas. In the forest areas, streams flowing through beaver meadows and other grassy cover have few or no muskrats. As a rule, suitable muskrat habitat on the forest streams is separated from that of the main valleys by wooded, rapidly flowing stretches. Once trapped out, such habitat is not soon repopulated. Pasture-field streams generally have good conditions of water and food, but dens are trampled by livestock except when dug into rather high banks. Muskrat houses are common in marshy situations in the large valleys, but these areas are small and appear to be completely trapped out each winter. Serious overtrapping of the streams is prevented by ice and fluctuating water levels.

Placental scars were found in only seven of 58 females examined during the 1949-50 trapping season. The number of scars ranged from 8 to 22, with an average of 15; there was no evidence of more than two litters having been produced or of females of the spring litter having bred.

SPECIMENS COLLECTED. (Includes large series of skeletal material obtained from fur dealers.) Total: 147—Lycoming 138, Potter 2, Tioga 6, Union 1.

BOBCAT

(Lynx rufus rufus)

DISTRIBUTION. Nowhere numerous, but less rare in the eastern Allegheny Mountains Section than in the High Plateaus Section and Ridge and Valley Section.

HABITAT. Rocky areas in extensive wooded tracts.

NOTES. A few wildcats are killed each year by individuals who hunt the species for sport, but most of the cats taken are accounted for by hunters or trappers seeking other quarry. In the Hillsgrove, Sullivan County, area where five were bagged during 1949-50, residents

consider wildcats to be scarce; on the other hand, many residents of areas in which none have been taken in recent years believe that cats are numerous "in the mountains."

As a result of the removal in 1938 of the bounty ($15) on wildcats a slight increase in numbers has undoubtedly occurred, but since evidence of serious predation at this time is lacking, and since the trophy value of the bobcat is high, its return to the bounty list would be unwise.

OTTER

(Lutra canadensis canadensis)

DISTRIBUTION. Originally throughout the region. Present distribution unknown.

HABITAT. Streams.

NOTES. A large aquatic mammal that is neither a beaver nor a mink is occasionally reported from the streams of the eastern end of the Allegheny Mountains section. District Game Protector Norman Erickson found the tracks of a pair of otters in McKean County during February, 1950.

SKUNK

(Mephitis mephitis nigra)

DISTRIBUTION. All counties.

HABITAT. Field and brush.

NOTES. The staple foods of the skunk are insects and other in vertebrates which it finds by systematically searching the surface of the ground. Mice, small snakes, salamanders, frogs, ground-nesting birds and their eggs, carrion, and berries are also taken. It is not un common for a skunk to live near or even under a chicken coop withou disturbing the birds, but occasionally severe losses of both chicks and grown fowl do occur. Recurrent losses are unnecessary since the skunk is easily trapped.

At the present time, the skunk population is increasing slowly as result of low fur prices ($.25 to $1.25) that discourage trapping. I western Clearfield and Bradford counties a sharp decline in the numbe of skunks is reported to have occurred about 1944, but normal number are reported at the present time. Elsewhere in the region the populatio trend has been steadily upward.

SPECIMENS COLLECTED. Total: 30—Cameron 2, Centre 3, Ly coming 24, Potter 1.

MINK

(Mustela vison mink)

DISTRIBUTION. Generally distributed in all counties.

HABITAT. Streams, marsh, and shoreline generally, but frequently found far from water.

NOTES. No marked fluctuation in the numbers of the mink during recent years was reported in this region. Mink are common along both small, mountain brooks and the larger streams of the main valleys, but where acid pollution is general, mink are scarce. Although the mink is entirely carnivorous, the bulk of its food consists of such items as crawfish, frogs, minnows, mice, and other non-game animals. It can, and does, take cottontails, muskrats, and game fish but in this region its depredations are not considered to be great.

Small dark mink, probably the northeastern mink, *Mustela vison vison*, are reported to be fairly common in Sullivan and northern Lycoming counties, but no specimens of this form were obtained.

SPECIMENS COLLECTED. Total: 8—Centre 1, Lycoming 3, Tioga 4.

LEAST WEASEL

(Mustela rixosa allegheniensis)

DISTRIBUTION. Exact distribution unknown; probably occurs in all counties.

HABITAT. Specimens taken in western Pennsylvania by Mammal Survey parties were from fields, bushy fields, marshes, and fencerows between fields. Elsewhere it is reported from both fields and forest.

NOTES. From January 1948 to October 1950, 13 specimens from counties in this sector were presented for bounty as follows: Bradford 1, Centre 4, Clearfield 4, Potter 3, Tioga 1. Their relative scarcity in this section is shown by the fact that, during the same time, 31 were taken in Westmoreland County, in southwestern Pennsylvania.

NEW YORK WEASEL

(Mustela frenata noveboracensis)

DISTRIBUTION. Found in all counties but consistently common in certain areas and scarce in others.

HABITAT. Frequents all habitats.

NOTES. Small mammals and birds are the preferred food. Earthworms, insects, and cold-blooded vertebrates are also eaten but whether by choice or of necessity is not known. Foul carrion is shunned, but untainted meat is eaten even when frozen.

Although the weasel has been made the symbol of treachery, it is actually a courageous and forthright beast. In travelling or hunting it makes no apparent attempt at concealment and its willingness to attack, in the face of danger, is well known. Its destructiveness in a poultry house is probably seldom duplicated in the field and the fact that the digestive tracts of weasels taken in traps are usually almost, or completely empty indicates that hunger, rather than sport, prompts the weasel to hunt.

When hunting, the weasel carefully examines all cover and may spend several days in a small area. Rocky woods, fencerow stonepiles, hummocks in swamps, windfalls, and culverts appear to be especially attractive. Woodchuck burrows are rarely overlooked and are located by the weasel even when covered deeply with snow.

The price paid to trappers for weasel pelts during recent years has ranged from $1 to $3 which, with the addition of the $1 bounty, has made weasel trapping well worth the effort involved. At the present time, the number of weasels taken is steadily decreasing.

SPECIMENS COLLECTED. Total: 17—Bradford 1, Centre 1, Clinton 1, Lycoming 11, Potter 2, Sullivan 1.

BONAPARTE WEASEL

(Mustela erminea cicognanii)

DISTRIBUTION. The southern limit of distribution is probably within this sector.

HABITAT. Our specimens were taken in a brushy fencerow well removed from woods.

NOTES. A male and a female were taken in the same meat-baited rat trap two days apart. Traps in woods in this locality (Alba, Bradford County) took one New York weasel. District Game Protector Leslie Wood reports that this species is not uncommon in southern Tioga County at the present time.

SPECIMENS COLLECTED. Total: 2—Bradford County.

RED FOX

(Vulpes fulva fulva)

DISTRIBUTION. Generally distributed in all counties.

HABITAT. Occurs in all habitats.

NOTES. The red fox reached its maximum abundance in this region in the period from 1945 to 1947, when over seven thousand were offered for bounty. A marked decline in the number probated in the southern counties during the fiscal year 1948-49 was not shared by the northern tier. Tioga County, with an area of 1150 square miles, presented

1539 foxes for bounty, as against a total of 1515 red foxes from the counties of Cameron, Clearfield, Lycoming, Snyder, Sullivan, and Union with a combined area of 5008 square miles.

It is of interest to note that the agricultural areas of Tioga and Bradford counties are the best cottontail covers of north central Pennsylvania.

No obvious preference for fields was noted in the region, and red fox tracks were commonly found in laurel and other dense cover as well as in open woods. It is reasonable to assume that, during periods of high population levels, the foxes fully occupy even marginal habitats and that such a situation now prevails in north central Pennsylvania.

Woodchuck holes in fencerows, woods, or occasionally even open fields and old straw and haystacks, rock slides and crevices are used as dens by the red fox. The area about the den is usually littered with food remains which offer impressive evidence of the amount and scope of predation at this period, although mice, etc., are likely to be wholly consumed or to decompose quickly if not eaten, while chicken wings and cottontail feet tend to accumulate.

Popular interest in foxes is centered on their role as predators, and their sporting potentialities are but poorly realized. Although a slightly increasing number of individuals keep hounds and hunt foxes as recreation, fox hunting is generally considered a vermin-control activity. In farming country, the red fox affords good shooting. In forested areas its habit of running far and long, discourages hunting with hounds.

SPECIMENS COLLECTED. Total: 6—Centre 1, Clinton 1, Lycoming 2, Potter 1, Sullivan 1.

GRAY FOX

(Urocyon cinereoargenteus cinereoargenteus)

DISTRIBUTION. Generally distributed in all counties.

HABITAT. In this region, the gray fox is found in all types of habitat along with the red fox.

NOTES. With the state-wide increase in the number of both red and gray foxes since 1941, the number of gray foxes offered for bounty in the northern counties of this region has increased spectacularly. Nearly four times as many gray foxes were probated from Bradford, Potter, Sullivan, and Tioga counties in 1946-47 as in 1942-43. The 1948-49 bounty figures for these counties are practically the same as for 1946-47 although state-wide figures show a substantial decrease. In Cameron, Centre, Clinton, Lycoming, Snyder, and Union counties the number of gray foxes bountied in 1946-47 was approximately twice as great as in 1942-43. In Clearfield County three times as many were probated. By 1948-49 significant decreases were noted in all counties except Cameron where no change occurred. Fewer gray foxes were taken in Snyder and Union counties in 1948-49 than in 1942-43.

The interpretation of bounty figures is complicated by such factors as fur prices, general employment levels and prevailing wage scales,

weather conditions during the general trapping season, bounty rates, and the possibility of migration from adjoining non-bounty areas. The above figures are offered in support of the general observation that gray foxes have increased in number in the past decade and that a decline in population is now in progress in the southern counties of this region.

The gray fox requires dense cover for a den location but it hunts for food in open fields as well as in brush or woods. Lacking the red fox's endurance, it seldom runs far afield when pursued but seeks to elude the hounds by crossing and recrossing a relatively small area. For this reason it is the favorite quarry of many who hunt foxes with dog and gun.

Fruit, grains, and insects are important foods in season. Meat, fresh or carrion, is taken whenever obtainable. Woodchuck, cottontail, squirrels, mice, moles, shrews and birds are the principle animal foods. From the time that the pups are whelped until they are foraging for themselves, predation by foxes is at its peak. The amount of food brought to the den is frequently more than the young can consume. At any other time, the bulk of the food of either species of fox consists of whatever is most easily obtained. During the summer and early fall, berries and insects are the most common food items. Apples are important in the winter diet. Deer carcasses and paunches are visited as long as anything remains to be eaten and provide a significant amount of food in the region as a whole.

SPECIMENS COLLECTED. Total: 2—Centre.

INSECTIVORES

HAIRY-TAILED MOLE

(Parascalops breweri)

DISTRIBUTION. Occurs in all counties.

HABITAT. Deep, fertile, well-drained soils are optimum habitat; not found in water-saturated soils and uncommon in thin and sterile soils.

NOTES. The hairy-tailed mole is more common than might be inferred from the number collected. In some areas, trapping was made difficult by stony ground. In others by the fact that, in silty soils, a mole can displace the soil without springing a spear-type trap. Our largest series was collected when trapping was done in the immediate headquarters area where it was possible to visit and re-adjust the traps at frequent intervals.

The runways of this mole are freely used by all other terrestrial mammals of small size. Runways are frequently abandoned for considerable periods of time, only to be re-occupied and heavily travelled later on. This abandonment was noted especially during dry summer weather and may be correlated with scarcity of food in the abandoned area.

SPECIMENS COLLECTED. Total: 19—Centre 1, Clearfield 1, Clinton 11, Potter 3, Sullivan 3.

SUMMARY OF KILL RECORDS FOR NORTH CENTRAL PENNSYLVANIA BY COUNTIES

County	*Area Sq. Mi.*	* *% in Cropland*	*Red Foxes Offered for Bounty 1948-49*	*Gray Foxes Offered for Bounty 1948-49*	*Weasels Offered for Bounty 1948-49*	*Deer Kill (Antlered) 1949*	*Deer Kill (Antlerless) 1949*	*Bear Kill 1949*	*Beaver Trapped 1950*
Bradford	1,156	34	1,202	537	1,433	1,065	1,845	2	60
Cameron	401	2	109	110	3	1,253	2,331	58	46
Centre	1,116	19	410	385	354	1,798	3,714	11	38
Clearfield	1,144	14	269	386	432	1,602	Closed	4	79
Clinton	902	8	199	380	59	1,645	2,434	54	47
Lycoming	1,223	20	358	504	267	2,008	3,239	38	43
Potter	1,092	11	1,138	241	84	3,664	7,436	26	206
Snyder	329	45	141	44	233	175	189	1	0
Sullivan	479	9	151	144	317	1,087	2,339	15	57
Tioga	1,150	24	1,539	353	285	1,957	2,684	29	75
Union	318	34	77	60	134	310	435	8	2
Area Totals	9,310		5,593	3,144	3,601	16,564	27,146	246	653
State Totals	45,333		17,561	17,770	20,263	46,602	84,121	411	2,777

* United States Census of Agriculture, 1945.

STAR-NOSED MOLE

(Condylura cristata cristata)

DISTRIBUTION. Occurs in suitable habitat in all counties.

HABITAT. Moist or wet soils generally, but not restricted to any well defined habitat; equally common in both woods and open situations.

NOTES. The star-nosed mole inhabits soils that are too wet for the hairy-tailed mole. Only occasionally does it venture into normally well drained areas. Its runways, which are found in muck, gravel, clay, and frequently in sphagnum and sedge roots above the ground surface proper, are commonly used by other species of small mammals. Usually its runways open to the surface more frequently than those of *Parascalops*. Mounds of muck thrown up by this species are often confused with crawfish work but do not have the opening characteristic of the crawfish "chimney."

The "star" and long tail of *Condylura* are sufficiently distinctive to impress even the casual observer. Most people who do not differentiate between *Microtus* and *Parascalops* do recognize the star-nosed mole as a form distinct from "ground moles" generally.

This species appears to be less sturdy than the hairy-tailed mole and is more frequently taken in snap traps.

A female taken on April 20 contained five embryos 10 mm. in length. One taken on May 26 showed 11 placental scars of uniform size and density.

SPECIMENS COLLECTED. Total: 30—Cameron 21, Lycoming 1, Potter 3, Sullivan 2, Union 3.

MASKED SHREW

(Sorex cinereus cinereus)

DISTRIBUTION. Probably occurs in all counties.

HABITAT. Found in all types of habitat.

NOTES. The masked shrew is not abundant in any part of this region. Since but few persons are aware of its existence, we are unable to determine whether its present scarcity is a normal condition. It was taken most frequently in rocky or stony woods and swamps, but some specimens appeared in traplines in dry grassy situations. Not taking it in a trapline is no proof of its absence. Our only Bradford County specimen was taken by a housecat in an area which had been heavily trapped for a month.

SPECIMENS COLLECTED. Total: 28—Bradford 1, Cameron 4, Clinton 1, Lycoming 14, Potter 2, Sullivan 2, Union 4.

BIG-TAILED SHREW

(Sorex dispar)

DISTRIBUTION. Probably occurs in suitable habitat in all counties.

HABITAT. Rocky areas; talus slopes, both loose rock and jointed rock-bed, are suitable.

NOTES. At McGees Mills, Clearfield County, one specimen was taken near the edge of the water of the south branch of the Susquehanna River. A dense growth of yellow and black birch over an impenetrable rhododendron tangle covered the slope. The shrew was taken at a small hole under a birch root that probably entered a joint of the massive sandstone exposed at numerous places in the area.

One specimen was collected on a dry rock slope with scattered black birch about half way up Penn Creek Mountain near Glen Iron, Union County. Two were taken in rocks on the crest of North White Deer Mountain, 3½ miles south of South Williamsport, Lycoming County, in thin chestnut oak woods with an understory of blueberry, azalea, witch hazel, and laurel.

SPECIMENS COLLECTED. Total: 4—Clearfield 1, Lycoming 2, Union 1.

SMOKY SHREW

(Sorex fumeus fumeus)

DISTRIBUTION. Occurs in all counties.

HABITAT. More common in wooded than in open areas. Loose rock and stone, seeps and brooks, and abundant leaf mold, rotting logs, etc. are commonly associated with high populations but do not appear to be necessary to the existence of the species.

NOTES. In the McGees Mills area of Clearfield and Indiana counties this shrew was common in *Synaptomys* runways in brushy fields of poverty grass. None were taken in hemlock and rhododendron growing in deep humus among sandstone boulders near one of these fields. However, not one was taken in poverty grass areas in Potter County, although it was common to abundant in seepy areas in woods and in narrow weedy stream bottoms. Throughout the region it was most commonly found in rocky or stony habitat, but never found in great numbers.

Pregnant or nursing females were taken as early as April 24 and as late at July 23.

SPECIMENS COLLECTED. Total: 139—Bradford 4, Cameron 26, Centre 15, Clearfield 9, Clinton 1, Lycoming 30, Potter 36, Sullivan 13, Union 5.

WATER SHREW

(Sorex palustris albibarbis)

DISTRIBUTION. Generally distributed through the northern counties and probably locally in the mountains of the Ridge and Valley, and southern Allegheny Mountain sections. Occurs in all major drainages of the region.

HABITAT. Stream edge.

NOTES. The water shrew was taken in situations ranging from a marshy seep at the edge of a small stream bottom to a tumbling rocky brook. A gravelly shallow brook-trout stream, about six feet wide, with abundant weeds, brush, and trash along its banks, was the most productive. Traps set well back from strong daylight took most of our specimens, and none were taken in traps located more than a few inches from overhead cover.

That its extremely local distribution on a particular stream is a plausible explanation of the supposed rarity of the water shrew in this region is suggested by the fact that in trapping about 1½ miles of a stream with uniform conditions of cover, bed, and bank, five shrews were taken within a distance of approximately 300 yards and none elsewhere along the stream. Two shrews were taken close together in each of the other two trap lines that produced more than one specimen.

There is no record of the occurrence of the water shrew due west of this region. Messrs. William C. Grimm and Harvey A. Roberts collected a specimen in southern Somerset County, and Messrs. Clay C. Gifford and Ralph Whitebread have taken it in Mifflin County.

A female collected on April 26 contained four embryos less than 2 mm. in size.

SPECIMENS COLLECTED. Total: 11—Bradford 2, Potter 7, Sullivan 2.

PYGMY SHREW

(Microsorex hoyi)

DISTRIBUTION. Not known in Pennsylvania.

NOTES. Although the northern counties of Pennsylvania have been intensively trapped, none of these small shrews has been taken by the mammal survey projects. The only record we have of this shrew in our section is a portion (rostrum) of a skull found in the stomach of a red fox. The fox was one of several that had been trapped in Potter County during April 1949 by professional trappers.

LEAST SHREW

(Cryptotis parva parva)

DISTRIBUTION. Unknown.

HABITAT. Elsewhere in Pennsylvania, *Cryptotis* has been taken in sparse herbaceous cover.

NOTES. *Cryptotis* remains from a fox scat collected in Rose Valley, Lycoming County, late in March, 1949, is the only evidence we obtained of the presence of this small shrew in this region. It has been taken in large series to the south and in smaller numbers to the west and east of our sector. Our failure to trap a specimen is probably due as much to inability to recognize suitable cover as to scarcity of the animal.

SHORT-TAILED SHREW

(Blarina brevicauda brevicauda)

DISTRIBUTION. Common in all counties.

HABITAT. Occurs in all terrestrial habitats.

NOTES. The short-tailed shrew is commonly identified as a "ground mole," but since this term is applied also to all the microtine mice, the long-tailed shrews, the hairy-tailed mole, and occasionally to the star-nosed mole, *Blarina* can hardly be said to have a common name in this region.

The short-tailed shrew feeds mainly on invertebrates but will make a meal of anything that it can overpower, including others of its own species. Its general occurrence and large food requirements make it as important a destroyer of insects as our songbirds. Since it is active at all hours and seasons, it is eaten by all predatory species.

Breeding begins in early spring and is at its peak during April and May. Occasional pregnant females are taken as late as November, but their scarcity indicates that the reproductive rate of *Blarina* is not to be compared with that of the deer mouse and meadow mouse. Placental scars are small, but distinct, in the short-tailed shrew. In all cases where scars were found these were of uniform size and density. If a second litter of young is born in a season, the scars of the first completely disappear prior to the birth of the second litter.

SPECIMENS COLLECTED. Total: 571—Bradford 62, Cameron 87, Centre 15, Clearfield 38, Clinton 44, Lycoming 94, Potter 119, Sullivan 55, Union 57.

BATS

DISTRIBUTION. None of the nine species of bats recorded from north central Pennsylvania is restricted to this region.

HABITAT. The red bat (*Lasiurus borealis*), the silver-haired bat (*Lasionycteris noctivagans*), and the hoary bat (*Lasiurus cinereus*) hang up in trees during the day and hunt in and near woods. The Leib bat (*Myotis subulatus leibii*) and the Indiana bat (*Myotis sodalis*) have been taken in caves in Centre County (Mohr 1932) but nothing is known of their feeding habits in this state. The remaining species, while not restricted in habitat, are most numerous in Centre, Union, and Snyder counties where optimum conditions are provided by the presence of numerous caves and phenomenal insect hatches from the unpolluted streams of the area.

NOTES. Along Penns Creek in Union and Centre counties, where the little brown bat (*Myotis lucifugus lucifugus*) is abundant, particularly large concentrations were observed during heavy mayfly hatches. On three occasions Mr. Cole Wilde took this species on dry flies while trout fishing. These bats were hooked through the wing or tail membranes. Several hundred little brown bats were seen over a Clinton County beaver dam in a section where the species is not generally abundant.

The big brown bat (*Eptesicus fuscus*) is the most uniformly distributed bat of the region although often locally outnumbered by the red bat or the little brown bat. Like the latter species, it may be found roosting singly or in large colonies in caves or buildings. A series of 22 pre-flight young from an attic at Gum Stump, Centre County, ranged from 66 to 88 mm. in length. Two adult females taken at the same time accepted any young bat placed in contact with them. Trouessart bats (*Myotis keenii septentrionalis*) were collected in a group of sheds in Cameron County, and one Clinton County specimen was brought in by a cat that habitually pounced at passing bats from the top of a lumber pile.

The red bat (*Lasiurus borealis*) was especially common in Sullivan, Clinton, and northern Centre counties. Its habit of taking wing early in the evening and its distinctive coloration make for easy identification.

A series of hibernating pygmy bats (*Pipistrellus subflavus obscurus*) collected in Woodward Cave on March 25, 1949, were the only specimens of the species obtained during the survey; none was identified in flight at any time. On May 23, 1949, no bats of this species remained in Woodward Cave.

On the March 25, 1950, visit to Woodward Cave no Indiana bats, (*Myotis sodalis*) or Leib bats (*Myotis subulatus leibii*) were observed. We were told that these species had been present in the cave early in February.

No silver-haired bats (*Lasionycteris noctivagans*) or hoary bats (*Lasiurus cinereus*) were collected. A large bat observed under good light conditions by Mr. Frederick Hilton and the author on August 29, 1950, at Tamarack, Clinton County, was probably a hoary bat.

SPECIMENS TAKEN. *Myotis lucifugus lucifugus.* Total: 72—Cameron 1, Centre 31, Clinton 8, Potter 5, Sullivan 2, Union 25.

Myotis keenii septentrionalis. Total: 10—Cameron 9, Clinton 1.

Pipistrellus subflavus obscurus. Total: 11—Centre.

Eptesicus fuscus fuscus. Total: 52—Cameron 1, Centre 30, Clinton 14, Potter 1, Sullivan 1, Union 5.

Lasiurus borealis borealis. Total: 8—Centre 4, Clinton 3, Sullivan 1.

NON-GAME RODENTS

CHIPMUNK

(Tamias striatus lysteri)

DISTRIBUTION. Occurs in all counties.

HABITAT. All habitats except open fields and low wet areas.

NOTES. The chipmunk was found to be generally common and locally abundant in all sections. An exceptionally high population in the Alba, Bradford County, area in 1949 is unique in that all other species of sciurids were also very numerous at the same time.

The food of the chipmunk consists chiefly of seeds, berries, nuts, snails, slugs, and insects. During the fall it stores quantities of food which are consumed after it emerges from hibernation. Young of the spring litter probably also draw heavily on these stores.

The chipmunk goes into hibernation later than the woodchuck and the jumping mice. In Bradford County, woodchucks were in hibernation early in October, but chipmunks were quite active on sunny days in mid-November, and tracks were seen in the snow a week later. In February there appears to be a period of activity, probably a rut, after which a few or no chipmunks are active until late March or early April.

Spring and fall litters are produced, but whether a female gives birth to more than a single litter is not evident from gross examination of the uterus. Four to six young make up the average litter.

SPECIMENS COLLECTED. Total: 163—Bradford 63, Cameron 5, Centre 19, Clearfield 6, Clinton 18, Lycoming 1, Potter 27, Sullivan 19, Union 5.

NORTHERN FLYING SQUIRREL

(Glaucomys sabrinus macrotis)

DISTRIBUTION. Locally throughout the plateau and possibly also along the mountains of the Ridge and Valley Section.

HABITAT. More common in deciduous or mixed forest than in pure coniferous stands in this area.

NOTES. The northern flying squirrel was taken along with the eastern flying squirrel at McGees Mills, Clearfield County, in second growth beech-birch-maple woods with a few scattered hemlocks. At Alba, Bradford County, both species were taken in mature chestnut oak woods on Armenia Mountain and in mature hemlock-hardwood at the foot of the mountain. None was taken in traplines in pure stands of conifers near these areas.

SPECIMENS COLLECTED. Total: 16—Bradford 13, Clearfield 3.

EASTERN FLYING SQUIRREL

(Glaucomys volans volans)

DISTRIBUTION. Occurs in all counties.

HABITAT. Forest and thicket.

NOTES. Large populations of flying squirrels are most commonly found in mature or old timber with an abundance of cavities such as woodpecker holes and hollow limbs. In woody thickets, nests of bark and twigs are constructed.

Flying squirrels appear to be subject to extreme local fluctuations in abundance which are not related to any obvious habitat factor. The food consists of a wide variety of items and includes seeds and nuts, insects, snails, and other invertebrates. It is fond of meat and probably feeds to some extent on birds' eggs and nestlings in season.

The flying squirrel is active only at night, but like other squirrels it does not appear to move about freely in windy weather. It frequently invades the attics of rural and suburban homes to the great dismay of all but the soundest sleeper.

SPECIMENS COLLECTED. Total: 37—Bradford 23, Clearfield 5, Clinton 1, Lycoming 8.

NORTHERN WHITE-FOOTED MOUSE OR DEER MOUSE

(Peromyscus leucopus noveboracensis)

DISTRIBUTION. All counties.

HABITAT. All terrestrial habitats where overhead cover is present; rarely found in fields away from brushy cover.

NOTES. The white-footed mouse inhabits a greater variety of situations than does any other of our mammals except the short-tailed shrew. In most localities in this region it is the most abundant mammal. Pastured or cultivated fields are suitable habitat only when cover such as brush, stone piles, stumps, or shocked grain are present. A woven wire fence will provide the cover it needs, but goldenrod and aster stems appear to be unsuitable in this region.

This mouse climbs well and frequently is found living in tree cavities, deserted squirrel nests, and bird nests, which it remodels to its liking.

Seeds of all kinds, hickory nuts, and snails, insects, and other invertebrates are eaten. These are almost invariably consumed under the protection of a stone, bush, or similar overhead cover.

SPECIMENS COLLECTED. Total: 911—Bradford 116, Cameron 95, Centre 67, Clearfield 25, Clinton 68, Lycoming 254, Potter 42, Sullivan 25, Union 219.

CLOUDLAND DEER MOUSE

(Peromyscus maniculatus nubiterrae)

DISTRIBUTION. Occurs locally in all counties.

HABITAT. Forest.

NOTES. Most of the traplines in which the cloudland deer mouse was taken were located in cool, moist, rocky, or stony forest, and the total catch was generally small. In Potter and Cameron counties this mouse was common in second growth sugar maple-beech-birch woods with well developed soils. In many areas of suitable habitat this species appeared to be absent, and in no case was it found to occupy an area to the complete exclusion of the northern white-footed mouse.

A nest of these mice was found in a woodpecker hole about twenty feet above the ground. One adult, two subadult, and three juveniles composed the group.

SPECIMENS COLLECTED. Total: 191—Bradford 6, Cameron 75, Centre 9, Clearfield 27, Clinton 11, Lycoming 9, Potter 35, Sullivan 19.

PRAIRIE DEER MOUSE

(Peromyscus maniculatus bairdii)

DISTRIBUTION. Probably locally in all counties.

HABITAT. Well drained situations with sparse herbaceous cover.

NOTES. Large populations of this mouse were found in corn and soybean stubble in the White Deer Valley. Small series were taken elsewhere in grain stubble, grazed and ungrazed pasture, sweet clover, and on road berms. It was not found in any poorly drained situation or in dense grass adjacent to areas in which it was taken.

The prairie deer mouse feeds on the seeds of herbaceous plants to a greater extent than do the other members of its genus, but insects are probably taken when available. We found no evidence of its utilizing cherry pits and hickory nuts where these were present in the fields.

Breeding begins early in March, in the Williamsport area, and continues until September. Several litters are born. In late March, pregnant females with placental scars of an earlier litter were taken. Three or four appears to be the usual litter size.

SPECIMENS COLLECTED. Total: 105—Bradford 18, Lycoming 84, Union 3.

WOOD RAT

(Neotoma magister)

DISTRIBUTION. Generally distributed in the Ridge and Valley Section and locally in the Allegheny Mountains Section.

HABITAT. Dry rock slides and cliffs.

NOTES. The presence of the wood rat about cliffs and ledges is indicated by heaps of sticks, twigs, dried plants, and miscellaneous trash and by urine stains and accumulations of droppings. In talus slopes the middens are usually out of sight and millipedes commonly consume the scats. Under these conditions, close inspection is necessary to detect the existence of even a large population.

The wood rat cuts and cures shoots of herbs and shrubs, fern fronds, and fungi, which are added to the nest pile. To what extent this material is used for food is not clear, but the bark of *Rhododendron* and other woody plants is an important winter food. Fruits and herbaceous plants are eaten during the warm months. A captive female ate a litter of young *Microtus* in preference to rolled oats, crackers, raisins, and peanut butter.

Trapped rats are often badly cut up by others, but specimens kept alive for short periods showed no inclination to bite if handled gently.

Four placental scars were noted in one lactating female.

SPECIMENS COLLECTED. Total: 13—Centre 5, Clinton 2, Lycoming 1, Union 5.

LEMMING MOUSE

(Synaptomys cooperi stonei)

DISTRIBUTION. Probably occurs in all counties; no specimens were taken nor sign observed in any locality in the Ridge and Valley Section.

HABITAT. Most common in grassland, but occurs also in forest habitats.

NOTES. Unlike others of our native mice, the lemming mouse is an untidy housekeeper, whose narrow runways are generally littered with inch-long cuttings and characteristic bright green droppings. Its runways are located just under the sod and open to the surface at close intervals. A runway opened to admit a trap may be closed off and that section detoured via a parallel passageway. One Cameron County colony apparently constructed no main runways of its own but used those of the star-nosed mole. In this locality, no sign of surface activity was noted during the extremely dry weather of August, 1949, although old sign was present. Immediately after rain had started a new growth

of grass, fresh cuttings and droppings became common and a small series was collected without difficulty.

In poverty grass (*Danthonia spicata*) lemming mice working under the snow often produce "eatouts" by feeding on the crowns of the grass clumps and so killing many of the plants. The loose dead grass of these areas, which may vary from a few square feet to a square rod or more, is especially noticeable after undisturbed grass has commenced growth. On sterile soils, "eatouts" persist for several years.

While the presence of lemming mice in an area is rather easily determined, securing a specimen is an uncertain undertaking in many instances, since this species appears to desert areas in which cuttings and droppings have accumulated. Although only two of twenty-two specimens collected were taken in areas where no sign was found, many areas with abundant sign were trapped without success.

Three pregnant females taken in August and September contained 4, 2, and 3 embryos.

SPECIMENS COLLECTED. Total: 22—Bradford 2, Cameron 9, Clearfield 3, Clinton 5, Potter 2, Sullivan 1.

RED-BACKED MOUSE

(Clethrionomys gapperi gapperi)

DISTRIBUTION. Occurs in all counties.

HABITAT. Forest. On the mountains of the Ridge and Valley Section the red-backed mouse inhabits talus slopes with widely scattered trees, as well as the cool moist forest that appears to be the optimum habitat of the species in the rest of the region.

NOTES. The red-backed mouse along with the cottontail, snowshoe hare and woodchuck appears to be a victim of deer competition. With the disappearance of evergreen ferns and herbaceous plants, the red-backed mouse is reduced to feeding on mosses and is exposed to predation. This species is scarce and local in all areas where overbrowsing has occurred. It is common in suitable habitat wherever deer damage is not extensive.

Although this mouse rarely enters clearings, it is common in the extensive rock slopes of the mountains and there is frequently taken in dry exposed situations. The rocks trap large quantities of windblown seeds and have a good invertebrate population to supply food for their mammal populations. Also it is probable that conditions of temperature and humidity several feet below the surface may approximate those of the deep forest.

Juvenile and pregnant females were taken as early as January 22, but the main breeding period is from April through June. No obviously juvenile specimens were collected in Bradford County in November.

SPECIMENS COLLECTED. Total: 176—Bradford 12, Cameron 5, Centre 17, Clearfield 31, Clinton 10, Lycoming 43, Potter 5, Sullivan 5, Union 48.

MEADOW MOUSE

(Microtus pennsylvanicus pennsylvanicus)

DISTRIBUTION. Occurs in all counties.

HABITAT. Grasses, sedges, and rushes provide suitable conditions whether in pure stands or mixed with other herbaceous plants, brush, or trees. Dense grassy cover in moist to wet situations is optimum habitat.

NOTES. References to "ground moles" in all sections of the region proved in most cases to pertain to this mouse or to the short-tailed shrew (*Blarina*).

During inspection of the Alba, Bradford County, area in November 1948, *Microtus* were found to be exceptionally abundant in hay meadows and in wet rushy swales in pasture fields. Several mice and much sign were seen on thin soiled rocky pastured knolls where blackberry canes, poverty grass, and *Poa compressa* provided but little cover. However, in October and November, 1949, even the best of these habitats harbored but few mice and considerable effort was expended in the collection of a small series from this locality.

A high population of meadow mice was present in part of a large apple orchard in Rose Valley, Lycoming County in March 1949. Trees up to 12 inches in diameter had been completely girdled during the winter of 1947-48 and additional damage to the trunks had been inflicted during 1948-49. Small roots had been cut off and eaten, and large roots had been barked by the mice although strychnine-coated wheat had been put out in November and December 1948 as a control measure. It is of interest that no other small mammal was taken in the orchard although *Microtus*, *Peromyscus* and *Blarina* were common on the road banks at the edge of the orchard and in an adjacent field.

Along Penns Creek, at Glen Iron, Union County, during May and June, 1949 this species was abundant on the grassy banks and low areas bordering the streams, but not in nearby grassy thickets and fields.

Microtus were numerous on the Susquehanna Sub-Depot, Letterkenny Ordnance during the winter of 1948-49; in February and March 1950 this species was scarce on the Depot.

Elsewhere meadow mice were uniformly scarce but such evidence of former high populations as old nests, deeply worn runways, and reports of numerous mice in hay and grain fields was encountered in all localities.

Occasionally meadow mice are taken in densely wooded, cold ravines well removed from grassy habitat. The rarity of such catches suggests that these individuals are not part of the normal mammal population of the ravines.

In areas of low population *Microtus* was more dependably to be found in weedy and brushy areas, along stream banks, or in the vicinity of stumps and rock outcrops where grass is present rather than in the uniform grassy areas which are the optimum habitat during periods of abundance. A similar situation exists with *Peromyscus maniculatus nubiterrae* which when scarce was found only in rocky sites but was taken in the greatest numbers on rather well developed soils.

SPECIMENS COLLECTED. Total: 304—Bradford 20, Cameron 15, Centre 12, Clearfield 16, Clinton 3, Lycoming 146, Potter 11, Sullivan 8, Union 73.

ROCK VOLE

(Microtus chrotorrhinus chrotorrhinus)

DISTRIBUTION. Unknown. Known only from Sullivan County in this region.

HABITAT. Cool rocky forest.

NOTES. Four specimens of this mouse were taken by Mr. Cole Wilde between April 19 and April 26, 1950, in completely browsed-out forest near Hillsgrove, Sullivan County. Yellow and black birch, sugar and red maple, basswood, hemlock, white ash, and butternut were the principal tree species, with the birches comprising about fifty per cent of the stand. Rocks, rotting logs and stumps were present in the two-acre portion of the woods in which the mice were taken. Intensive trapping in the immediate vicinity, and in similar situations elsewhere in the area, was unsuccessful.

Moss cuttings and microtine droppings were generally distributed in abundance throughout this area but appeared to have been produced under snow cover. One specimen of *Synaptomys* and five of *Clethrionomys* were the only other microtines taken in this type of habitat, and since sign similar to that noted here has been associated with *Clethrionomys* in other localities, it is reasonable to assume that this species was responsible for the cuttings and droppings seen here.

SPECIMENS COLLECTED. Total: 4—Sullivan County.

PINE MOUSE

(Pitymys pinetorum scalopsoides)

DISTRIBUTION. Probably occurs in all counties.

HABITAT. Apparently restricted to light friable soils such as silty and sandy loams, whether deep or shallow and stony.

NOTES. Although the pine mouse was taken in five localities we were unable to learn much concerning its habitat requirements except that a light soil appears to be essential to it. Moisture conditions ranged from very dry to moist brookside situations. Soil depth ranged from a few inches to many feet. Plant cover included thin grass and brush, dense grass, and mature woods. In every case, the first specimen taken was totally unexpected and we were unable to identify any characteristic sign of the species.

Juveniles were taken in June, July, and August.

SPECIMENS COLLECTED. Total: 19—Bradford 9, Cameron 1, Centre 1, Clinton 3, Union 5.

HOUSE MOUSE

(Mus musculus musculus)

DISTRIBUTION. Occurs in all counties.

HABITAT. Generally in the vicinity of human habitation. Occasionally found in wooded areas.

NOTES. House mice are locally common in fields near farmsteads, but only three specimens were taken in two localities at considerable distances from human habitation. Of these, one was taken within a hundred yards of a quantity of household trash, but two specimens taken along Hevner Run in Clinton County were a mile distant from the nearest road or home.

Where house mice were numerous in the fields, no white-footed mice were taken.

SPECIMENS COLLECTED (Feral). Total: 3—Clinton 2, Potter 1.

NORWAY RAT

(Rattus norvegicus)

DISTRIBUTION. Occurs in every county.

HABITAT. Generally in the vicinity of human habitation and rubbish dumps. Locally common in fields and along streams.

NOTES. In the Williamsport area, the brown rat is common in fields and wooded areas along the west branch of the Susquehanna River and Lycoming Creek where it appears to be fully established and regularly causes serious damage to shocked corn. Elsewhere it is reported to be a field pest only occasionally.

The black rat, *Rattus rattus rattus*, appears to have disappeared from this region at least thirty years ago.

MEADOW JUMPING MOUSE

(Zapus hudsonius hudsonius)

DISTRIBUTION. Occurs in all counties.

HABITAT. Weedy low meadows and thickets appear to be the optimum habitat, but also found in dry grassy areas and occasionally in thin woods.

NOTES. Neither of the jumping mice is numerous in this region at the present time. Of the two forms the meadow jumping mouse is the less common. Judging by the number of people of all ages who

are familiar with the "deer mouse," these species must at times be quite numerous. (Elsewhere in this report the common name "deer mouse" refers only to *Peromyscus.*)

Although *Zapus* and *Napaeozapus* were taken in the same trapline at two localities in Potter County, the two do not generally occur together.

In Bradford County, the meadow jumping mouse appeared to have begun hibernation early in October. A specimen unearthed by a construction crew in November was reported to be hibernating in a nest of grass and leaves only four inches below the surface of the ground.

SPECIMENS COLLECTED. Total: 40—Centre 5, Clinton 4, Potter 11, Sullivan 4, Union 16.

WOODLAND JUMPING MOUSE

(Napaeozapus insignis insignis)

DISTRIBUTION. Occurs in all counties.

HABITAT. Cool moist forest.

NOTES. The woodland jumping mouse is seldom taken far from water or from the cover of trees and brush. In Potter County, it was found to occur generally in suitable cover, but elsewhere it was quite local. Thirteen specimens trapped in southwestern Clearfield County between April 27, 1949, and May 5, 1949, were all males. In Sullivan County three males were taken between April 19 and 27, 1950. On May 9, two pregnant females were taken. The latest date on which this species was taken is September 28, 1949, in Cameron County, but since no good cover was trapped in Bradford County during October 1949, this should not be considered as fixing the beginning of hibernation.

SPECIMENS COLLECTED. Total: 84—Cameron 18, Centre 5, Clearfield 13, Clinton 4, Lycoming 2, Potter 21, Sullivan 17, Union 4.

PORCUPINE

(Erethizon dorsatum dorsatum)

DISTRIBUTION. Local in the mountains of the Ridge and Valley Section; general in the forested areas of the plateau province.

HABITAT. Forest. Rock dens are a favorable but not a necessary feature.

NOTES. At the present time the porcupine is re-occupying areas from which it had disappeared as a result of deforestation. It appears to be increasing rapidly in the mountains of the Ridge and Valley Section.

During the spring and summer, the porcupine feeds on the leaves and twigs of trees and on herbaceous plants generally, but during the winter it subsists entirely on bark. Birch, maple, aspen, oak, cherry, and beech

appear to be just as commonly eaten as hemlock and pine which are usually said to be the preferred food species. Actually, the porcupine appears to be free of any prejudice in the matter of food. The cover afforded by conifers may be as important as their food value.

When climbing a densely branched tree or limb, the porcupine frequently clears the way by biting off the branches. Whether branches are cut for any other reason is not apparent, but so-called "porcupine platforms" are probably only chance accumulations of branches. The trash heaps of wood rats are commonly and erroneously attributed to the porcupine.

The porcupine produces a variety of grunting sounds and a somewhat rythmic sound often described as suggesting that of a saw being filed. In addition, it emits on occasion a loud and penetrating scream which may well be the basis of many modern panther tales.

Except for man, the porcupine has no enemies of importance. Its damage to buildings, equipment, and dogs is sufficient to justify its destruction in the vicinity of homes and camps. Where porcupines are numerous, hunting game with dogs involves considerable risk, since even "porcupine proof" dogs often run onto porkies and suffer injury. Vinegar, or baking soda, are often recommended for the removal of porcupine quills, but we found no one who, on the basis of personal experience, would vouch for the efficacy of anything except pliers.

SPECIMENS COLECTED. Total: 21—Bradford 1, Cameron 2, Clinton 3, Indiana 2, Lycoming 1, Potter 4, Sullivan 8.

VANISHED SPECIES

The species listed below are known to have existed in north central Pennsylvania. The county and date given is the last record of the species in the region. In all cases, the animals were rare for many years prior to their extinction.

Beaver: Union County, 1913; Bison: Union County, 1790 or 1800; Canada Lynx: Clinton County, 1874; Eastern Elk: Centre County, 1877; Fisher: Clinton County, 1901; Marten: Sullivan County, 1900; Panther: Clearfield County, 1905; Wolf: Clearfield County, 1892; Wolverine: Potter County, 1863.

The beaver and western elk have been introduced by the Pennsylvania Game Commission into this sector.

CHANGES IN MAMMAL POPULATIONS

The following summary of the status of mammal populations is based largely upon information obtained through interviews or, in the case of the smaller mammals, trapping results and signs observed.

Fur Bearers

Opossum: Increasing rapidly in the northern counties and slowly in the southern counties.

Raccoon: Abundant for several years and apparently still increasing in numbers.

Muskrat: In recent years, the population of muskrats has been stable at a level that trappers generally consider rather low.

Skunk: Generally increasing.

Foxes: Numerous, but decreasing locally at least.

Mink: Numbers practically unchanged for many years.

Weasels: Traditionally scarce in many areas and decreasing at present.

Beaver: Numbers remain stable.

Game Animals

Woodchuck: Increasing steadily in all agricultural areas. Less common than formerly in overbrowsed forest areas.

Snowshoe Hares: Not abundant, but increasing.

Rabbits and Squirrels: Abundant in some areas and scarce in others. The red squirrel at present is unusually scarce over much of the region.

Deer: Decreasing in the traditional deer country, and increasing in western Clearfield County.

Other Mammals

Chipmunk: Generally common to abundant and has been increasing in recent years.

Flying Squirrels: Scarce except in southwestern Bradford County in the fall of 1949. Reports from other areas suggest that there were many areas of local abundance at that time.

Meadow Mouse: Scarce in 1949 after having been abundant in 1948. Extremely scarce in 1950.

Deer Mouse: Generally scarce both in 1949 and 1950. Several areas of local abundance were encountered in 1949, but in 1950 uniform scarcity prevailed.

Porcupine: Slowly increasing in numbers and range.

DATA AND REPORTS

The original data, field notes, and specimens on which this report is based have been deposited in the Section of Mammals, Carnegie Museum, Pittsburgh, Pennsylvania.

This report was prepared by Harry R. Roslund, Project Leader.

CONCLUSIONS AND RECOMMENDATIONS

1. It is recommended that an integrated study of all phases of deer management be instituted under the immediate and effective supervision of a single responsible head. Among the problems that deserve special attention are:
   a. At what level of population is satisfactory forest tree reproduction possible in the presence of deer.
   b. Size of deer and antler development under different range conditions.
   c. Reproductive rate under various range conditions.
   d. The feasibility of the reestablishment of various native shrubs in areas from which they have been eliminated by deer.

2. It is recommended that the provision for the abrogation of antlerless deer seasons be repealed to allow the Game Commission authority commensurate with its responsibility for the management of the deer herd.

3. It is recommended that refuge areas be opened to the hunting of deer only.

4. It is recommended that experimental reintroduction of the varying hare in suitable habitat in the Ridge and Valley Section be made.

5. It is recommended that a wild turkey management study be initiated now while turkeys are increasing in numbers and expanding their range.

6. It is recommended that the practicability of small game habitat improvement through the use of lime alone and of lime and phosphate together as soil conditioners be fully investigated.

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